

MAR 9 1917

FLORA

OF THE PRAIRIE PROVINCES

Bernard Boivin

NEW YORK BOTANICAL GARDE

Part III

(continued)

113. COMPOSITAE

(COMPOSITE FAMILY)

Floret lacking an involucl and typically with 5 anthers fused into a ring around the style. The bulk of the species with flowers in heads belong in this family.

- a. Heads radiate.
 - b. Pappus of capillary bristles.....Group I
 - bb. Pappus lacking or different, of awns, chaff, scales or minute bristles.....Group II
- aa. Florets all ligulate or all tubular.
 - c. Heads discoid.....Group III
 - cc. Florets all ligulateGroup IV

Group I

Heads normally with a ring of ligulate flowers. Central flowers all tubular. Casuals sports may be double or discoid. Species that are normally discoid are also included in Group III. Pappus of numerous fine bristles usually at least as long as the achene.

- a. Ligules white, pink, blue or purple.....Group 1-A
- aa. YellowGroup 1-B

Group 1-A

Ligules not yellow.

- a. Annual with a taproot.....14. Machaeranthera p. 126
- aa. With a rhizome or caudex, rarely perennial with a taproot.
 - b. Tegules narrow and numerous, all of the same length or a few of the outer ones much shorter.....15. Erigeron p.127
 - bb. Broader and unequal, usually imbricated and the outer gradually shorter, sometimes the outer larger than the inner and \pm foliaceus.

- c. Ligules coloured and/or the inflorescence not corymbiform.
- d. Stemless.....12. Townsendia p.108
- dd. Stem present.
 - e. Heads many or rarely single and small.....13. Aster p. 109
 - ee. With a single large head.
 - f. Disk 2-3 cm across when dried; perennial from a taproot..... 12. Townsendia p. 108
 - ff. Somewhat narrower; perennial from a branched caudex..... 13. Aster p.109
- cc. Flowers white; heads in a corymb.
 - g. Pappus of dimegueth bristles, the outer about 1 mm long..... 13. Aster p. 109
 - gg. Much longer and isomegueth..... 8. Solidago p. 98

Group 1-B

Ligules and florets yellow.

- a. Leaves opposite..... 47. Arnica p. 177
- aa. Leaves alternate or all basal.
 - b. Monocephalous plants.
 - c. Tegules of uniform length..15. Erigeron p. 127
 - cc. Imbricated, the outer gradually shorter..... 9. Haplopappus p. 106
- bb. Heads normally numerous.
 - d. Tegules nearly all of the same length, a few of the outer ones many times shorter..... 48. Senecio p. 183
 - dd. Much imbricated.
 - e. Perennial from a rhizome or caudex.....8. Solidago p. 98
 - ee. Taprooted perennials.
 - f. Pappus bristles dimegueth, the outer much shorter..... 7. Chrysopsis p. 98
 - ff. Bristles of uneven length but not sorted out in two series..... 9. Haplopappus p. 106

Group II

As in Group I but the pappus not of bristles, sometimes lacking, or of scales, or awns, or chaff, the latter often setaceous-tipped.

- a. Ligules not yellow, mostly white, but often coloured..... Group-II-A
- aa. Ligules yellow.

- b. Receptacle chaffy or bristly..... Group-II-B
 bb. Receptacle naked..... Group-II-C
 Group II-A

Radiate in white, pink or purple, not in yellow.

- a. Leaves opposite33. Galinsoga p. 161
 aa. Alternate or all basal.
 b. Leaves entire or nearly so.
 c. Rays 2 cm long or more...26. Echinacea p. 154
 cc. Much shorter.
 d. Stemless or monocephalous..... 12. Townsendia p. 108
 dd. Stem present; heads numerous..... 11. Boltonia p. 108
 bb. Dentate to much dissected.
 e. Closely or coarsely dentate.
 f. Ligules deep red brown..... 39. Gaillardia p. 164
 ff. White.
 g. Ligules \pm 1mm long 41. Achillea p. 165
 gg. Larger, 3-5 cm long..... 43. Chrysanthemum p. 169
 ee. Finely and repeatedly dissected.
 h. Ligules 3 mm long or less..... 41. Achillea p. 165
 hh. Larger, 4-20 mm long.
 i. Receptacle naked... ..42. Matricaria p. 167
 ii. Each floret subtended by a bractlet (= chaff)... .. 40. Anthemis p. 165

Group II-B

Heads radiate in yellow and the receptacle chaffy or bristly, that is with the tubular florets individually subtended by bractlets or bristles.

- a. Leaves opposite, becoming alternate in the inflorescence.
 b. Rays formed by the larger inner tegules..... 32. Bidens p. 160
 bb. Rays formed by the prolongation of the corolla of the peripheral flowers.
 c. Leaves narrowly pinnatifid to bipinnatifid..... 30. Coreopsis p. 159
 cc. Entire to coarsely lobed.
 d. Head center much higher than wide; receptacle conical; peripheral florets fertile 24. Heliopsis p. 152

- dd. Head not so high; receptacle flattish; peripheral florets sterile 29. Helianthus p. 155
- aa. Leaves alternate.
- e. Ligules bicolour, deep red-brown towards the base..... 39. Gaillardia p. 164
- ee. Yellow.
- f. Head cylindric with 4-5 drooping ligules 27. Ratibida p. 154
- ff. Head shorter and the rays much more numerous.
- g. Leaves mainly basal, the cauline ones only 1-3 and much reduce 28. Balsamorhiza p. 154
- gg. Stem quite leafy.
- h. Leaves narrowly dissected 40. Anthemis p. 165
- hh. Entire to dentate.
- i. Disk flattish to somewhat convex..... 29. Helianthus p. 155
- ii. Hemispheric to oblong and very protuberent.. 25. Rudbeckia p. 153

Group II-C

Heads radiate in yellow; receptacle naked, i.e. neither chaffy nor bristly.

- a. Leaves opposite 36. Bahia p. 163
- aa. Alternate or basal.
- b. Leaves all basal or remotely pectinatifid 37. Hymenoxys p. 163
- bb. Stem leafy, the leaves entire or less narrowly divided, dentate to pinnatifid with broad lobes.
- c. Somewhat shrubby at base; heads small and numerous 6. Gutierrezia p. 98
- cc. Stem herbaceous to the base; heads larger or longer.
- d. Heads rather inconspicuous, the rays only about 2 mm long and only 1-3 per head..... 34. Madia p. 162
- dd. Ligules more numerous and much longer.
- e. Heads very sticky; tegules strongly squarrose..... 5. Grindelia p. 97
- ee. Tegules neither sticky nor squarrose.
- f. Ligules cuneate, coarsely trilobed at summit 38. Helenium p. 164

- ff. Ligulate or slightly wider near the middle and finely 3-toothed at summit 49. Calendula p. 192

Group III

Heads discoid.

- a. Leaves and/or heads spiny or catchy by hooked prickles Group III-A
 aa. Not spiny.
 b. Leaves opposite or verticillate Group III-B
 bb. Alternate.
 c. Various special types: semishrubby, or the heads all or mostly in terminal racemes, or the heads globular with the outer florets pendant .. Group III-C
 cc. More run-of-the-mill types.
 d. Pappus of capillary bristles .Group III-D
 dd. Lacking or chaffy Group III-E

Group III-A

Tegules and/or leaf lobes ending in stiff sharp spines or with hooked tips.

- a. Head catchy, the tegules ending into spines hooked at tip.
 b. Fruits axillary23. Xanthium p. 151
 bb. Heads terminal 51. Arctium p. 193
 aa. Spines not hooked but stiff and sharp at tip.
 c. Only the heads spiny.
 d. Heads all terminal and spiny
 56. Centaurea p. 200
 dd. Some heads axillary and spiny
 22. Ambrosia p. 150
 cc. The leaves also spiny-lobed.
 e. Pappus plumose 54. Cirsium p. 196
 ee. Barbellate or glabrous.
 f. Barbellate; tegules gradually tapered from base to tip
 53. Carduus p. 195
 ff. Pappus bristles glabrous; tegules constricted towards the middle 55. Silybum p. 200

Group III-B

Leaves opposite or verticillate.

- a. Achene devoid of pappus.
 b. Head with an involucre very different from the leaves 21. Iva p. 149

- bb. No involucre, but the head subtended by a few foliage leaves 16. Psilocarphus p. 139
- aa. Pappus present.
- c. Pappus of 2-(4) terminal awns or horns.
- d. Inner tegules connate, about twice as long as the outer.. 31. Thelesperma p. 160
- dd. Free and petaloid or shorter than the outer 32. Bidens p. 160
- cc. Pappus of capillary bristles.
- e. Leaves becoming alternate in the inflorescence 3. Brickelia p. 96
- ee. All opposite.
- f. Florets yellow 47. Arnica p. 171
- ff. White or purplish ... 2. Eupatorium p. 94

Group III-C

Various unusual types.

- a. Heads globose, terminal on very long peduncles 50. Echinops p. 193
- aa. More numerous and in racemes or panicles.
- b. Inflorescence a raceme; herbaceous plants.
- c. With a taproot or corm; heads purple 4. Liatris p. 96
- cc. Stoloniferous; heads white 17. Antennaria p. 139
- bb. Heads paniculate; shrubby at base.
- d. Leaves opposite, heads white 3. Brickelia p. 96
- dd. Leaves alternate and narrow, heads yellow.
- e. Leaves spinulose-serrate 14. Machaeranthera p. 126
- ee. Entire 10. Chrysothamnus p. 108

Group III-D

Not spiny; heads discoid; leaves alternate; pappus of capillary bristles.

- a. Corollas yellow 48. Senecio p. 183
- aa. Not yellow, but white, pink, etc.
- b. Pappus plumose 52. Saussurea p. 194
- bb. Barbellate or glabrous.
- c. Stem leaves reduced to large foliaceous petioles; normal leaves large and all basal 46. Petasites p. 175
- cc. Stem with normal leaves.
- d. Herbage copiously white-wooly; leaves entire.

- e. Flowers all perfect; taprooted herbs 19. Gnaphalium p.148
- ee. Some flowers staminate only; mostly with stolons or a rhizome.
 - f. Flowers dioecious
..... 17. Antennaria p.139
 - ff. Central florets staminate, the peripheral pistillate ..
..... 18. Anaphalis p.147
- dd. Pubescence different; leaves mostly dentate.
 - g. Pappus, like the corollas, purplish 1. Vernonia p. 94
 - gg. Pappus white to tawny.
 - h. Tegules narrow, numerous and long-tapered, all of the same length or a few of the outer ones many times shorter
..... 15. Erigeron p.127
 - hh. Tegules uneven, the outer much longer or more commonly imbricated in gradually shorter rings.
 - i. Tegule tips flabellately enlarged, or flabellately lobed to pectinatifid, or flabellately spiny
..... 56. Centaurea p.200
 - ii. Tegule tips entire and not enlarged.
 - j. Fibrous-rooted and usually stoloniferous..
..... 13. Aster p.109
 - jj. Taprooted; not stoloniferous
.14. Machaeranthera p.126

Group III-E

As III-D but the pappus lacking or chaffy.

- a. Main leaves opposite 21. Iva p.149
- aa. Alternate.
 - b. Leaves entire to coarsely toothed.
 - c. Leaves large, deltoid-ovate ...
..... 20. Adenocaulon p.149
 - cc. Smaller and narrower, elliptic to linear.
 - d. Involucral bracts in one series and uniform in length 34. Madia p.162
 - dd. In many series and the outer ones successively shorter.

- e. Receptacle bristly; heads few, large and mostly terminating elongated branches..... 56. Centaurea p. 200
- ee. Receptacle naked; heads many and small, on pedicels often shorter than the heads.
 - f. Leaves closely and finely crenate..43. Chrysanthemum p. 169
 - ff. Entire or with a few rather coarse and remote teeth or lobes..... 45. Artemisia p. 171
- bb. More dissected, narrowly pinnatifid to tripinnatifid.
 - g. Pappus of scales \pm 1 mm long; leaves narrowly pectinatipartite 35. Hymenopappus p. 162
 - gg. No pappus.
 - h. Inflorescence paniculate to spiciform..... 45. Artemisia p. 171
 - hh. Inflorescence not so elongate but corymbiform.
 - i. Annual; receptacle conical 42. Matricaria p. 167
 - ii. Perennial; receptacle flattish to slightly raised towards the middle 44. Tanacetum p. 170

Group IV

Flowers all ligulate. Stem and leaves commonly with a milky juice.

- a. Scapose Group IV-A
- aa. Stem \pm leafy.
 - b. Pappus of minute scales.
 - c. Flowers blue 57. Cichorium p. 201
 - cc. Yellow 58. Lapsana p. 202
 - bb. Pappus of bristles.
 - d. Bristles plumose Group IV-B
 - dd. Merely barbellate or scabrous Group IV-C

Group IV-A

Scapose herbs. Head solitary and borne directly on the rhizome, the peduncle naked or merely with small bracts, not leafy. Florets all ligulate.

- a. Achene beakless.
 - b. Leaves tomentose-ciliate; achene about 8 mm long 59. Microseris p. 202

- bb. Leaves not ciliate or at least not tomentose-ciliate; achene much smaller. 72. Hieracium p. 214
- aa. Pappus borne at the end of a long beak.
 - c. Pappus bristles plumose; receptacle chaffy 61. Hypochaeris p. 203
- cc. Bristles smooth or slightly scabrous; receptacle not chaffy.
 - d. Achene becoming spinulose-muricate towards the tip 65. Taraxacum p. 205
 - dd. Achene uniformly tuberculate on the ridges 69. Agoseris p. 210

Group IV-B

Stem leafy. Otherwise as IV-A. Pappus of branched (i.e. plumose) bristles.

- a. Ligules pink 63. Stephanomeria p. 204
- aa. Yellow or sometimes orange to deep red.
 - b. Involucre not calyculate, the tegules isomegueth 64. Tragopogon p. 204
- bb. Tegules dissimilar, the outer ones many times shorter or much broader.
 - c. Leaves all basal or near basal 61. Hypochaeris p. 203
- cc. Stem leafy to the inflorescence 62. Picris p. 203

Group IV-C

Pappus of simple and smooth or scabrous bristles.

- a. Pappus double, the outer 5 units small and scale-like, the inner bristle-like 60. Krigia p. 203
- aa. Pappus of bristles only.
 - b. Achene compressed, at least twice as broad as thick.
 - c. Seed without beak or disk 66. Sonchus p. 206
 - cc. Pappus borne on a disk at the end of a \pm obvious beak... 67. Lactuca p. 207
- bb. Achene terete or polygonal, little if at all compressed.
 - d. Ligules yellow or orange to deep red.
 - e. Herbage long-pilose at least in part 72. Hieracium p. 214
 - ee. Glabrous or the pubescence very short or farinose.
 - f. Stem leafy towards the base only 59. Microseris p. 202
 - ff. Leafy throughout or at least in the upper part.. 70. Crepis p. 211

- dd. White or creamy or pink.
- g. Florets 5, pink ... 68. Lygodesmia p. 209
- gg. More numerous and usually white.
- h. Inflorescence a panicle or branched raceme 71. Prenanthes p. 213
- hh. Heads corymbose 72. Hieracium p. 214

1. VERNONIA Schreber

IRON-WEED

Style branches filiform, short-hirsute on the outer side only.

1. V. fasciculata Mx. var. corymbosa (Schwein.) Schub. -- Numerous discoid heads with purplish florets, pappus and tegule tips. Tufted virgate herb. Lanceolate leaves alternate, serrate. Heads numerous, mostly corymbose. Tegules conspicuously imbricate. Second half of summer. Along Rat and Red rivers at Otterburne and Morris; rare. -- scMan, US.

Doubtfully reported from "Weyburn Prairie, Sask." by Rydberg 1932, Russell 1937 & 1944 and Breitung 1957 on the basis of a collection by Sanson (NY). We share Breitung's doubt and consider that the locality or the label is almost surely incorrect. Not only is this specimen disjunct by 300 miles to the nearest locality of the species, but it has never been confirmed and it is also irregular on a phytogeographical basis as it belongs to var. fasciculata and not to var. corymbosa as it could be expected in the northwest corner of the range of the species. For another doubtful Weyburn report see under Desmodium canadense in Part IV.

2. EUPATORIUM

THOROUGHWORT

Style branches filiform like the above, but finely puberulent all around. Leaves opposite or verticillate.

- a. Leaves verticillate 1. E. purpureum
- aa. Opposite 2. E. perfoliatum

1. E. purpureum L. var. maculatum (L.) Darl. (E. maculatum L., var. Bruneri (Gray) Breit., var. foliosum Fern.) -- Joe-Pye-Weed -- Tall herb with large verticillate leaves. Leaves lanceolate, serrate. Heads discoid, pinkish purple, in a terminal corymb. Second half of summer. Marshy and semi-open spots in galerie-forests. -- NF-SPM, NS-S, BC, US -- F. Faxonii (Fern.) Boivin -- Flowers white. Local: Nipawin. -- NF, O, S, (US) -- F. tegulosum Boivin -- Floral parts modified into so many scales. Local anomaly: Otterburne -- se Man.

F. Faxonii (Fern.) stat. n., E. maculatum L. f. Faxonii Fern., Rhodora 47: 195. 1945.

F. tegulosum (Boivin) stat. n., E. maculatum L. f. tegulosum Boivin, Svensk Bot. Tidskr. 53: 431. 1959.

Plants with more densely pubescent herbage have been called var. Bruneri, but this may be only an ecological variant. Its greater frequency in the western part of the range is probably climatically conditioned.

The group of E. maculatum has had a checkered history and old records are not always readily interpreted. It started with Linnaeus as a group of three species: maculatum, purpureum and trifoliatum. By the time of the 1908 edition of the Gray's Manual these had been reduced to a single species and three varieties. But the pendulum has swung back and Barratt's 1841 classification was revived after being revised as to taxonomy by Wiegand 1920, amended as to nomenclature by Wiegand and Weatherby 1937. The proposed arrangements finally found their way into major eastern manuals with 4 species and one variety keyed out and described. We have always found this too complex arrangement unsatisfactory and others seem to have had the same trouble, judging from the many erratic identifications in the various herbaria visited. There is a general lack of morphological cleavage between the taxa and too much sympatry when the diagnostic criteria are applied rigorously. We have been able to recognize only two weak geographical varieties as follows.

The more eastern var. purpureum (= E. trifoliatum L.) has larger leaves, ovate-lanceolate, the main ones 4-8 cm wide and often 2 dm long or more; stem solid and purplish or speckled in purple; heads commonly pinkish, usually with 5-7 flowers each.

The widespread var. maculatum (= E. dubium W.; E. fistulosum Barratt) is more deeply coloured and its leaves are smaller by about half. Stem fistulose or solid, green or glaucous to purplish or purple-speckled. Main leaves mostly 2-4 cm wide and usually around 1 dm long. Heads darker in colour and bigger, usually with 8-12-(15) florets each.

Reports of var. maculatum from west of our area may possibly relate to introduced plants only. At any rate the only two B.C. collections we know, Lulu Island (DAO) and Chilliwack (CAN, DAO), seem to represent introductions.

2. E. perfoliatum L. -- Boneset, Thoroughwort (Herbe à souder) -- Leaves triangular-lanceolate and connate across their bases into perfoliate pairs. Leaves broadest at the base. Heads small, discoid and white in rounded terminal corymbs. Mid summer. Shores. -- NS-sMan, US.

Eupatorium rugosum Houtt. (E. urticifolium Reichard) was doubtfully reported from "Weyburn prairie, Sask." by Rydberg 1932, Russell 1937 & 1944 and Breitung 1957. The comment under Vernonia fasciculata seems equally applicable here. The habitat is quite wrong for an eastern forest species that would reach its limit of range some 400 miles further east. Nor is it likely that the specimens were collected in Manitoba as speculated by Breitung.

3. BRICKELIA Ell.

Like Eupatorium, with very long filiform styles, etc. Tegules strongly imbricate and strongly costate. Pappus bristles minutely barbellate.

1. B. grandiflora (Hooker) Nutt. -- Large white discoid heads somewhat drooping in terminal clusters. Leaves opposite, petiolate, deltoid-ovate or cordate, serrate, becoming alternate in the inflorescence. Tegules deep green, costate in white, the inner whitish at tip, the outer long caudate. Mid to late summer. Wet rocky places in the mountains: Waterton. -- swAlta, uS, (CA).

The first Canadian collection was by Dawson in 1874 at the Kootenay Pass (MTMG) while surveying the 49th parallel. A provincially ambiguous location, it has led to the species being reported from both Alberta and B.C., but more modern collections would restrict its Canadian range to Waterton Park only. Indeed modern collecting indicates that a fair proportion of Dawson's specimens labelled Kootenay Pass probably came from within Waterton Park as defined to-day.

4. LIATRIS Schreber

BLAZING STAR

Like the last two, but the pappus plumose and the tegules not striate.

a. Heads hemispheric to subglobose... 1. L. ligulistylis
aa. Much narrower, cylindrical 2. L. punctata

1. L. ligulistylis (Nelson) K. Schuman (L. aspera AA.; L. scariosa AA.) -- Showy and stiffly erect herb with a terminal raceme of a few large heads, the terminal one largest. Root a woody irregular and subglobose corm. Leaves lanceolate, the upper many times smaller. Heads purplish. Tegule tips concave, squarrose, erose, purplish and membranous-margined. Mid summer. Frequent in draws and around groves southward, in sandy woods northwards. --sMan-Alta, US --F. leucantha Shinners -- Flowers white. Local. --Man-S, (US).

Two sheets of this species at MTMG deserve special mention. Both were collected in 1855 by Jas. Anderson. Both specimens look like twin brothers, the way specimens from the same collection do. But they carry widely different locality data: "Mackenzie River" on one case, the other: "Found on the plain of Saskatchewan and North". In view of the known distribution of L. ligulistyliis, the locality data of the first specimen would seem to be erroneous and should presumably be changed to read like the second.

There are a number of other apparent range extensions among the Anderson specimens, mostly of prairie plants. But there are too many such extensions and quite a few appear improbable. We therefore have ignored them all unless confirmed by later collections and the localities given on his labels are considered to be generally questionable.

2. L. punctata Hooker var. punctata -- Taproot with a globular enlargement at some distance below the surface. Smaller than the last and the leaves linear and conspicuously scabrous-ciliate. Tegules ciliate, cuspidate. Mid summer. Frequent and showy on steppes and hillsides. -- Man-Alta, US -- F. albiflora (Sheldon)Boivin -- Flowers white. Scattered and very rare: Souris, Rock-glen --Man-S, US.

F. albiflora (Sheldon) stat. n., Laciniaria punctata (Hooker) Ktze. f. albiflora Sheldon, Quart. Bull. Univ. Minn. 1: 26. 1892; L. punctata Hooker f. albiflora Sheldon. nomen invalidum ex Scoggan, Fl. Man. 514. 1957; L. punctata Hooker. f. alba Horr & McGregor, Trans. Kansas Ac. Sc. 54: 216, 1951. The only U.S. collection seen of the white-flowered form was from Les Genoux, Montana (DAO).

Var. punctata is 0.5-4.0 dm high and its leaves are 3-5 mm wide. To the southeast it gives way to a var. nebraskana Gaiser, taller, 4-8 dm high, and with narrower and eciliate or barely ciliate leaves, 2-3 mm wide.

5. GRINDELIA W.

GUMWEED

Pappus of 2 or more deciduous awns. Heads large, radiate in yellow. Otherwise much as in Aster.

1. G. squarrosa (Pursh) Dunal var. squarrosa (var. quasiperennis Lunell, var. serrulata (Rydb.) Stey.; G. perennis Rydb.) -- Gumweed, Gumplant (Epinette de prairie) -- Very sticky heads, tangling readily by their very strongly squarrose tegules. Leaves serrate, resinous-punctate in darker green. Involucre very resinous. Mid to late summer. Somewhat saline soils, especially if disturbed. -- sMack, (NF), Q-BC, US.

Middle and upper stem leaves ovate to oblong-lanceolate and auriculate-clasping. The more western var.

integrifolia (Nutt.) stat. n., G. nana Nutt. var. integrifolia Nutt., Trans. Am. Phil. Soc. 7: 314. 1840, has narrower leaves, at least the middle and lower ones oblanceolate, long cuneate at base, sessile and neither auriculate nor clasping.

Other segregates listed as synonyms have the range of the species and appear to be part of the normal range of variation of the typical phase.

6. GUTIERREZIA Lag.

Similar to Solidago, though the pappus is of ciliate scales.

1. G. Sarothrae (Pursh) Britton & Rusby (G. diversifolia Greene) -- Broom-Weed -- Like a diminutive Solidago graminifolia. Tufted, semi-shrubby perennial with a taproot. Leaves linear, very narrow, scabrous. Heads somewhat glutinous. Late summer. Mainly eroded steppes and badlands. --Man-Alta, US, (CA).

7. CHRYSOPSIS Nutt.

GOLDEN ASTER

Like Solidago, with dimegueth pappus-bristles, the outer many times shorter.

1. C. villosa (Pursh) Nutt. (C. angustifolia Rydb.; C. hirsutissima Greene; C. hispida (Hooker) Nutt.) -- Like a yellow-flowered Aster. Tufted perennial, densely and stiffly pubescent throughout. Stem very long hirsute. Leaves oblanceolate, entire, very long ciliate towards the base. Tegules purple tipped. Summer. Common on light or disturbed soils. --Man-BC, US.

A rather variable type, often subdivided into many varieties or species. While we would hesitate to be too positive about extralimital segregates, within our area this species appears to form a single population, hence the consolidation.

8. SOLIDAGO L.

GOLDENROD

Like Aster, but the flowers yellow (white in two species). Heads rather small and the ligules short.

a. Stem leaves entire and long-linear; inflorescence corymbiform.

b. Ligules white..... 13. S. ptarmicoides

bb. Yellow; plants taller.

c. Leaves straight and flat, uniform in length 14. S. graminifolia

cc. Conduplicate, falcate, larger and the upper many times shorter

..... 12. S. Riddellii

aa. Stem leaves serrate.

- d. Leaves fairly uniform in length, the upper at least half as long as the lower.
 - e. Leaves obovate to broadly oblanceolate, typically oblong..... 8. S. mollis
 - ee. Rather narrowly lanceolate.
 - f. Stem pubescent 9. S. canadensis
 - ff. Glabrous except in the inflorescence 10. S. gigantea
- dd. Upper stem leaves gradually shorter..... Group A

Group A

- Leaves serrate and gradually shorter upwards, the lower ones at least twice as long as the upper.
- a. Leaves densely puberulent on both faces.
 - b. Heads in a rounded corymb..... 11. S. rigida
 - bb. In a panicle or a thyrse.
 - c. Heads in an elongated thyrse .. 1. S. bicolor
 - cc. In a panicle.
 - d. Panicle \pm secund; middle leaves less than 1 cm wide and narrowly oblanceolate 7. S. nemoralis
 - dd. Not secund; middle stem leaves broader and tending to elliptic ..
 - 8. S. mollis
 - aa. Glabrous or merely ciliate.
 - e. Inflorescence broadly pyramidal, over 1 dm wide 6. S. juncea
 - ee. Narrower and often elongate.
 - f. Lower leaves long ciliate towards the base; heads rather few and large 2. S. multiradiata
 - ff. Leaves not ciliate or merely finely scabrous-margined.
 - g. Achene pubescent.
 - h. Tufted; heads glutinous ..
 - 3. S. spathulata
 - hh. Stoloniferous; not glutinous 5. S. missouriensis
 - gg. Achenes glabrous.
 - i. Lower leaves at least 2 cm wide and the petioles somewhat sheathing at base.... 4. S. uliginosa
 - ii. Usually much narrower and tapered to a narrow base ..
 - 5. S. missouriensis

1. S. bicolor L. var. bicolor. -- Silverrod, Silverweed -- Herbage hispid throughout. Perennial from a short rhizome. Inflorescence an elongated thyrse, cylindrical or rarely narrowly paniculate. Ligules white

Tubular flowers tending to yellowish. Mid summer. Dry, semi-open places. --NS-Man, US -- var. concolor T. & G. (S. hispida Muhl., var. lanata (Hooker) Fern.) -- Ligules yellow when fresh, often fading or drying white. Green midnerve of the tegules tending to be narrower, narrowly oblanceolate, and more sharply contrasted with the larger paler and whitish margins. Dry open woods, frequent. --NF, NS, NB-S, US.

Var. concolor is commonly treated as a species (= S. hispida) but the difference amounts to only this single colour character, hence the rank of variety adopted here. The colour difference is quite obvious in the ligules when fresh, but there may be some fading in drying. In the tegules the colour is more variable and the difference is not susceptible of being sharply defined.

Var. lanata is an extreme of pubescence of sporadic occurrence.

2. S. multiradiata Aiton (var. scopulorum Gray S. scopulorum (Gray) Nelson) -- Heads rather large, the involucre (6)-7-(8) mm high, and not very numerous, mostly 10-20 per inflorescence. Puberulent in the inflorescence and the lower leaves long ciliate towards the base, otherwise glabrous. Stem leaves, especially the upper, tending to be oblong-oblanceolate. Thyrse rather short, sometimes merely round-corymbose, but usually a little bit taller and the lowest branch † drooping when fresh, tending to be a bit remote. Mid summer. Northern and montane or alpine meadows. --(F)-K-Aka, L-NF, NS, NB-BC, US.

3. S. spathulata DC. var. spathulata (var. nana (Gray) Cronq., var. neomexicana (Gray) Cronq.; S. decumbens Greene, var. oreophila (Rydb.) Fern.; S. oreophila Rydb.) -- Tegules glutinous, marking the paper in yellow in drying, remaining † shiny. Tufted, 1-5 dm high. Finely puberulent on the stem and in the inflorescence. Basal and lower leaves spathulate-oblanceolate. Inflorescence an elongate and cylindric thyrse. Mid summer. Common prairie species. --Mack-Aka, (NS), NB-O-(Man)-S-BC, US.

Often subdivided into a series of poorly defined and commonly intergrading varieties: the more common and more widely distributed type with narrower and more elongate leaves is var. neomexicana; smaller plants of higher altitudes are var. nana; here and there, especially in the mountains and closer to oceans or large bodies of water, one will find broader-leaved plants which may be termed var. spathulata westward or ssp. Randii (Porter) Cronq. in the east.

Around the Great Lakes there is a somewhat more clearly defined var. Gillmanii (Gray) Cronq., taller,

(4)-5-8-(10) dm high; leaves larger, the lower often up to 3-4 cm wide and more coarsely serrate; heads somewhat larger.

4. S. uliginosa Nutt. var. uliginosa (S. Purshii Porter); S. neglecta T. & G.; S. uniligulata (DC.) Porter) -- Lower leaves rather large, 1.5-3.0 dm long; including the sheathing petiole, and mostly 2-3 cm wide. Fairly tall, but less than 1 m high. Inflorescence elongate, a thyrse or a very narrow panicle. Late summer. Bogs. -- seK, L-SPM, NS-seMan, US.

In younger and smaller plants the branches are at first more strongly ascending and the heads not obviously secund. This is sometimes distinguished as A. Purshii.

Around the Great Lakes one finds smaller plants with narrower leaves 1 cm wide or less. These may be segregated varietally as var. jejunifolia (Steele) Boivin.

5. S. missouriensis Nutt. var. missouriensis -- Long stoloniferous and common prairie species usually 2-4 dm high. Glabrous or somewhat puberulent in the inflorescence. Leaves narrowly oblanceolate, less than 1.0 dm long, all or mostly less than 1 cm wide, the lower often scabrous-margined. Inflorescence very variable, short and usually less than 5 cm wide, heads not strongly secund. Involucre 3-4 mm high. Mid summer. Common in prairies and open places. -- wO-sBC, US -- Var. extraria Gray -- Heads larger, the involucre 4-5 mm high. Rocky ridges in the mountains and foothill prairies. -- swAlta, wUS -- Var. fasciculata Holz. (S. glaberrima Martens) -- Larger throughout, the inflorescence up to 1 dm wide and broadly pyramidal. Lower leaves up to 1.5 dm long. Plant commonly 4-5 dm high. Lower branches recurved at tip and their numerous heads all or mostly borne on the upper side only. More common in lighter or disturbed soils. -- wO-Alta, US.

Our 3 varieties intergrade freely and the last is somewhat transitional to S. juncea.

6. S. juncea Aiton -- Similar to the last variety, but larger throughout. Loosely tufted. Basal leaves 1.5-3.0 dm long, mostly 2-3 cm wide and forming large and conspicuous rosettes. Glabrous throughout. Inflorescence broadly pyramidal, commonly 1.5-2.0 dm wide, the lower branches elongate, recurved and bearing numerous heads turned upwards. Mid summer. Dry semi-open places: Sandilands. -- NS-seMan, US.

7. S. nemoralis Aiton (var. decemflora (DC.) Fern.; S. pulcherrima Nelson) -- Inflorescence usually strongly secund and mostly facing southward on sunny days, with the tips strongly arching in the opposite direction. Herbage densely puberulent throughout and somewhat sca-

brous on the leaves, Loosely tufted and mostly 2-4 dm high. Leaves oblanceolate. Mid summer. Hillsides and dryer prairies. --wNS-eBC, US.

The more western plants are commonly segregated as a var. decemflora on the basis of narrower and less dentate leaves, of larger heads and sericeous achenes. Our specimens do not conform readily to this dichotomy.

8. S. mollis Bartl. -- Stem leaves numerous and commonly elliptic, varying from narrowly obovate to broadly oblanceolate and obtuse to rounded at tip. Upper leaves many times smaller. Lower leaves slightly shorter than the middle ones but usually deciduous. Commonly 3-4 dm high, long stoloniferous, without basal rosettes but with short sterile shoots. Herbage densely puberulent and scabrous. Leaves with 3 stronger and nearly parallel nerves. Inflorescence thyrsiform to panicate. Second half of summer. Dryer prairies and steppes. --swMan-sAlta, US.

9. S. canadensis L. var. canadensis (var. fallax (Fern.) Beaudry, var. salebrosa (Piper) Jones; S. lepida AA., var. elongata (Nutt.) Fern.; var. fallax Fern.) -- Conspicuous virgate herb, often \pm 1 m high, with numerous small yellow heads. Long stoloniferous and without rosette but producing shorter sterile stems. Stem finely pubescent at least in the upper half, the hairs incurved. Leaves numerous, fairly uniform in length, mostly around 1 cm wide, narrowly lanceolate, with 3 much stronger nerves, \pm puberulent below, glabrous above to slightly puberulent, especially along the nerves. Inflorescence pyramidal. Mid summer. Open woods and moist meadows. -- Mack-(Y-Aka), L-NF, NS-BC, US -- Var. gilvocanescens Rydb. (S. dumetorum Lunell; S. gilvocanescens (Rydb.) Smyth; S. Lunellii Rydb.; S. pruinosa Greene) -- More pubescent, especially the leaves densely puberulent and scabrous above. Leaves often broader. Common in prairies. -- swMack, L-NF, NS, Q-BC, US. -- Var. scabra (Muhl.) T. & G. (S. altissima L.) -- Stem densely pubescent with longer, crisp-flexuous, and \pm spreading hairs, usually around 0.5 mm long. Leaves often similarly pilose, especially on the lower face. -- wNB-swQ-seMan, US.

It has been customary to restrict the application of S. canadensis to the plants with smaller heads, the involucre 2-3 mm high, its tegules mostly \pm 0.3 mm wide, and narrowly lanceolate leaves \pm 1 cm wide. Plants with larger heads and leaves have been distinguished as var. salebrosa, or var. fallax, or S. lepida, but the distinction does not appear to be a significant one in our area and we are dubious about its value elsewhere.

If the distinction is accepted, var. salebrosa may possibly be the correct name for the coarser plant, but,

as pointed out by Cronquist 1955, S. serotina Aiton var. minor Hooker 1834 could be an earlier and valid name. This name needs checking as to its exact meaning; unfortunately its type could not be located at K in 1969. A more recent var. fallax (Fern.) Beaudry, Nat. Can. 95: 37, 1968 has also been proposed for what appears to be essentially the same entity.

The use of S. lepida for our slightly larger-headed plants is erroneous. S. lepida DC. is a Pacific Coast species with a very narrow panicle of much fewer and much larger heads, the involucre 5-7 mm high.

9X. S. canadensis var. gilyocanescens X gigantea var. serotina -- With the broadly lanceolate leaves, about 2 cm wide, of either parent. Intermediate as to pubescence. Stem rather coarse as in S. gigantea, but puberulent towards the top as in S. canadensis. Some leaves glabrous below, some puberulent on the main nerves. Upper leaf surfaces partly or sparsely scabrous-puberulent. Heads rather large as in S. gigantea, the involucre 4mm high. Pincher Creek. --swAlta, (US).

10. S. gigantea Aiton var. serotina (Aiton) Cronq, (var. leiophylla Fern.; S. serotina Aiton) -- Closely resembling the last but larger and less pubescent. Stem coarser, mostly 1.0-1.5 m high. Glabrous except the inflorescence. Leaves rather lanceolate and commonly 2-3 cm wide, glabrous on both faces, scaberulous at margin. Heads tending to be large, the involucre commonly 3.5-4.0 mm high, the tegules often 0.5 mm wide or larger. Second half of summer. Mostly near watercourses and shores. --Mack, NS-eBC, US.

The more eastern var. gigantea is pubescent along the main nerves on the lower leaf surfaces, usually scabrous above. Old reports of the latter variety from Western North America are apparently to be discounted as pointed out by Cronquist 1955. The exact basis of Macoun's 1884 western report could not be readily determined; the original specimens are presumed to have been revised to other taxa. All western Canadian material found under var. gigantea at CAN, DAO and MT has been revised, mostly to var. serotina, but some also to S. canadensis and S. missouriensis.

11. S. rigida L. var. humilis Porter (var. canescens (Rydb.) Breitung; S. parvirigida Beaudry; Oligoneuron canescens Rydb.; O. rigidum AA.) -- Leaves conspicuously and pinnately veined, the lower leaves many times longer, oblong-lanceolate and long petiolate. Tufted, 2-7 dm high, with conspicuous rosettes 1.5-3.0 dm high. Herbage densely puberulent and somewhat scabrous. Inflorescence 3-10 cm wide, round-corymbose, its branches almost always abradate. Mid summer. Common on steppes. -- O-Alta, US.

Our variety is generally smaller and with fewer leaves, 5-23 per plant, the basal ones shorter. The more eastern var. rigida is (6) -10-(17) dm high; lower and basal leaves \pm lanceolate, 2.5-5.0 dm long including the petiole; stem leaves 20-30 per plant; inflorescence mostly larger, 7-16 cm wide, its lower branches more or less bracteolate in their lower half. We are keeping the two taxa at varietal rank because there is some degree of morphological overlap. Both varieties were reported (as species) from our area by Rydberg 1932 and Russell 1937, 1944 and 1954; but all western specimens examined, including duplicates of collection by Fraser (DAO) and by Russell (DAO), proved to be referable to var. humilis.

It was recently discovered that some specimens of var. rigida were tetraploid ($2n=36$) while others of var. humilis were diploid ($2n=18$). On that basis var. humilis was promptly elevated to specific rank as S. parvirigida. Such a procedure is considered to be unsound on two counts.

First it is an attempt to express the concepts of one speciality (genetics) in the terminology of another (taxonomy). This abuse of terminology can only create confusion for both specialities. That the geneticists have not yet provided themselves with their own naming procedures, as some other specialities have done (e.g. cultivar, forma specialis), may be a handicap to the geneticists, but it is not a justification to take over the terminology of taxonomy for genetic purposes.

The attempt at a take-over has gone quite far in some cases. Witness the following quote from a geneticist: "Plants which belong to different levels of ploidy are best considered, from a theoretical standpoint, as different species, even if they are morphologically identical, because the difference in the number of chromosomes constitutes a strong enough reproductive barrier to keep the populations separate under conditions of sympatry". -- Can. Journ. Gen. Cyt. 5: 167. 1963. -- Obviously the author of the quote would define the species in essentially chromosomal terms.

Second, it is based on a confusion between cause and effect. A species is first and foremost a discontinuous morphological unit. And the discontinuity implies the existence of a barrier to hybridization. Without such a barrier normal reproductive events would rapidly obliterate the discontinuity, and any taxonomic distinction would become impossible. However, the barrier itself, be it geographical or genetic or other, is not a taxonomic character in its own right, it is only the mechanism

that makes a morphological discontinuity eventually possible. And from this discontinuity arises the taxonomic character. The discovery of the exact nature of a barrier, or the discovery of an additional barrier -- a second level of ploidy in this case -- represents progress in our understanding of a taxon, but it is not the discovery of a new character and is not in itself a justification for changing the rank of said taxon. See also Boivin 1960.

Further it must be pointed out that in this particular case the ploidy levels exhibit only partial concordance with the morphology. Some specimens apparently quite typical of var. rigida proved to be now tetraploid (Beaudry 57-14-1 from Bloomfield, Mich.) now diploid (Beaudry 57-472 from Manchester, Tenn.). It is not uncommon to find more than one ploidy level within a species without corresponding morphological differentiation, or with only a weak differentiation, as in this case.

11X. S. Maheuxii Boivin -- Hybrid with S. Riddellii and generally similar to the latter, but the leaves are densely scabrous-puberulent and not quite so elongate. Inflorescence very broadly paniculate or round-corymbose. Rare: Kleefeld. --seMan.

12. S. Riddellii Frank -- Leaves conduplicate and falcate. Stoloniferous with rosettes up to 6 dm high. Herbage glabrous except for the very scabrous leaf margins. Inflorescence broad-corymbose. Late summer. On chernozems, rare: Kleefeld, Sainte-Geneviève. --O-seMan, US.

12X. S. Bernardii Boivin -- Hybrid with S. ptarmicoides and resembling mainly the latter, but the ligules at first pale yellow, eventually turning white. Leaves mostly about 5 mm wide and the heads not quite so large as the above. Rare: Kleefeld. --seMan, (US).

Hybr. n., Verosimiliter hybridus S. ptarmicoides X S. Riddellii. Ad. S. ptarmicoidem vergens sed floribus minoribus luteolis et albescentibus. Folia tantum latiora. Involucrum 6-7 mm alt. Type: Boivin, Bernard & Perron 12942, Kleefeld, 1½ milles au sud-est, prairie, 16 août 1958 (DAO).

13. S. ptarmicoides (Nees) Boivin (Aster ptarmicoides (Nees) T. & G.; Unamia alba (Nutt.) Rydb.) -- Flowers white and the heads rather large in a flat corymb, resembling an Aster. Mostly + 3 dm high and scabrous. Leaves very variable in length, very narrow, less than 5 mm wide, very scabrous at least at margin. Mid summer. Frequent on sandier soils in the parkland zone. -- NB-ecS, US.

Stat. n. Doellingeria ptarmicoides Nees, Gen. Sp. Ast. 183, 1832; Chrysopsis alba Nutt., Gen. 2: 152. 1818, nec Solidago alba Miller. The frequency and va-

riety of hybrids between this species and various other Solidago seems to be a clear indication that its relationships lie with the latter genus rather than with Aster. It is an atypical species in any case.

13X. S. lutescens (Lindley) Boivin (Aster ptarmicoides (Nees) T. & G. var. lutescens (Lindley) Gray) -- Hybrid with S. rigida var. humilis. Mainly of the habit of S. ptarmicoides, but the heads smaller, the ligules yellowish, the leaves broader and the upper ones not so much reduced, about half as long as the lower. Herbage densely scabrous-puberulent. Rare: Stoney Mountain, Bird's Hill, Brandon, Kleefeld, Virden, Red Deer, Indian Head, Touchwood. --Man-S, US.

Stat. n., Diplopappus lutescens Lindley ex DC., Prodr. 5: 278. 1836.

14. S. graminifolia (L.) Sal. var. graminifolia -- Povertyweed -- Leaves long linear and isomegueth, mostly 15-20 times as long as wide and usually 5 mm wide or less. Inflorescence a single, terminal, flat corymb of numerous small heads. Second half of summer. Common on shores and wet places. --NF, NS-seMan, BC, US -- Var. major (Mx.) Fern. (var. camporum AA.) -- Leaves broader and usually shorter, mostly 8-10 times as long as wide and commonly over 5 mm wide. -- Mack, (NF), Q-Alta-(BC), US.

S. occidentalis is also reported for our area by Rydberg 1917, 1932, Eastham 1947, Cronquist 1955 and, doubtfully, Boivin 1966. Efforts to substantiate this report have been unsuccessful as no relevant specimen could be located at ALTA, Calgary, CAN, DAO, GH, NY, UBC, WTU, etc.

9. HAPLOPAPPUS Endl.

Heads yellow as in Solidago, but larger as in Aster. Bristles somewhat unequal.

- a. Leaves finely dissected, pinnatipartite
- 1. H. spinulosus
- aa. Entire to serrate.
- b. Leaves serrate; mostly few-headed
- 3. H. lanceolatus
- bb. Entire; monocephalous.
- c. Subscapose, the leaves nearly all basal, the 1-2 stem leaves much smaller
- 2. H. armerioides
- cc. Stem leaves numerous and not particularly smaller
- 4. H. Lyallii

1. H. spinulosus (Pursh) DC. var. spinulosus (Aplo-pappus spinulosus (Pursh) DC.; Sideranthus spinulosus (Pursh) Sweet) -- Grayish-tomentose leaves pinnatipartite

to bipinnatifid, the lobes abruptly contracted into white, glabrous, spinescent points. Tegules strongly imbricate, with a dark green and nearly glabrous subterminal patch, and a white point like those of the leaf lobes. Mid summer. Occasional and scattered on steppes and eroded hillsides. --swMan-sAlta, US, (CA).

The more southern var. glaberrimus (Rydb.) stat. n., Sideranthus glaberrimus Rydb., Bull. Torr. Bot. Club 27: 621. 1900, has glabrous leaves.

2. H. armerioides (Nutt.) Gray (H. acaulis AA.; Aploppappus acaulis var. glabratus AA.; Stenotus acaulis AA.; S. armerioides Nutt.) -- Tegules with a conspicuous, dark green, deltoid patch at the squarrose tip. Cushion-forming perennial from a woody taproot. Basal leaves linear, erect, entire. Stem leaves few and inconspicuous, the plant scapose in general habit. Stem moncephalous and usually less than 1 dm high. Late spring. Eroded hillsides and badlands of the Qu'Appelle Valley and southwest. --S, US.

3. H. lanceolatus (Hooker) T. & G. var. lanceolatus (var. Vaseyi Parry; H. integrifolius AA.; Pyrocoma lanceolata (Hooker) Greene) -- Leaves strongly dimegueth, the basal petiolate, serrate to subentire, lanceolate, 2-5 times longer than the cauline, the latter sessile and clasping at base. Herbage glabrous or lightly villous. Stems stiffly erect from a decumbent base. Heads large, few or solitary. Mid summer. Saline meadows, frequent. -- S-Alta-(neBC), US -- Var. sublanatus Cody -- H. uniflorus (Hooker) T. & G.; Pyrocoma uniflora (Hooker) Greene) -- Heavily villous-lanate, especially on the involucre. More northern: basin of the Peace. --sMack, Alta.

The name H. uniflorus is generally misapplied in current floras and monographs. The type of the species (K) is quite typical of what we are calling above var. sublanatus. It is restricted to Canada in its distribution. But H. uniflorus is currently used to designate another species occurring from Montana to California, exclusive of Canada. This U.S. entity was first described as Homopappus inuloides Nutt., 1840 and is more correctly named Haplopappus inuloides (Nutt.) T. & G. The following three varieties are commonly distinguished:

Haplopappus inuloides var. Howellii (Gray) stat. n., H. Howellii Gray, Syn. Fl. ed. 2, suppl. part 1: 446. 1886.

H. inuloides var. gossypianus (Greene) stat. n., Pyrocoma gossypiana Greene, Pittonia 3: 23. 1896.

H. inuloides var. linearis (Keck) stat. n., H. uniflorus ssp. linearis Keck, Aliso 4: 103. 1958.

An Alberta report by Rydberg 1917 of Pyrrocoma carthamoides Hooker, was repeated by Cronquist 1955 as Haplopappus carthamoides (Hooker) Gray, and queried by Boivin 1967. No justifying specimen could be located at GH or NY in 1965 or at WTU in 1969, etc.

4. H. Lyallii Gray -- Glandular peberulent throughout. Usually less than 1 dm high. Stem leaves oblanceolate, the larger 5-10 mm wide, nearly as large as the similar basal leaves if any. Mid summer. Alpine slopes and shale slides. --swAlta-sBC, (nwUS).

10. CHRYSOTHAMNUS Nutt.

Almost identical to Haplopappus, but shrubby and the heads discoid.

1. C. nauseosus (Pallas) Britton var. nauseosus (C. frigidus Greene) -- Rabbit Brush -- Low shrub with numerous annual branches bearing a small terminal group of discoid heads. Usually less than 4 dm high and the new branches longer than the woody base. Branches whitish with a thin tomentum, sometimes inconspicuously so. Tegules usually tomentose. Mid summer. Badlands, uncommon. --sS-seAlta-BC, US -- Var. glabratus (Gray) Cronq. (var. graveolens (Nutt.) Hall) --More woody and taller, 4-10 dm high and the new shoots usually shorter than the woody base. Tegules glabrous. Estevan. --seS, BC, US.

11. BOLTONIA L'Hér.

Resembles Aster but the pappus is partly of minute bristles and partly of 2 or 4 somewhat longer awns.

1. B. asteroides (L.) L'Hér. var. occidentalis Gray (var. recognita (Fern. & Grisc.) Cronq.; (B. latisquama Gray var. recognita Fern. & Grisc.) -- Inflorescence leaves more or less decurrent. Perennial and stoloniferous. Stem longitudinally striate in light and dark green. Leaves narrowly lanceolate, entire, scabrous-margined. Heads white, resembling Aster. Tegules acute. Fall. Shores, sometimes weedy; rare or possibly overlooked because of lateness. --scMan-scS, US.

In the ozarkian var. latisquama (Gray) Cronq. the tegules are round-obtuse at tip.

12. TOWNSENDIA Hooker

Closely resembling Aster; pappus bristles gradually thickened towards the base, almost awn-like. Monocephalous or stemless.

- a. Stem mostly 1-2 dm high 3. T. Parryi
 aa. Stemless.
 b. Tegules gradually less densely ciliated upwards 1. T. excapa

- bb. More densely ciliate and ending in a tuft
of hair 2. T. Hookeri

1. T. excapa (Rich.) Porter (T. sericea Hooker) -- Usually a cluster of 3-6 large heads overtopped by the basal leaves, the latter linear and mostly 2-4 mm wide. Involucre 12-20 mm high, the tegules around 2 mm wide. Ligules pink. Spring. Sandy hillsides, infrequent. -- swMan-sS-seBC, US.

2. T. Hookeri Beaman (T. sericea AA.) -- Like a reduced version of the last. Leaves 1-2 mm wide. Involucre 8-12 mm high. Ligules white. Early summer. Local on sandy steppes and eroded badlands: Cypress Hills and Rockies. --Y, swS-Alta, nwUS.

The range was extended to B.C. in Contr. Gray Herb. 183: 96. 1957, but this may have been a lapsus calami as the specimen cited came from Fort McLeod, in Alberta.

3. T. Parryi Eaton -- A single large head, 3-6 cm wide, at the end of a rather short stem. Perennial. Stem solitary and stiffly erect, or a few together. Leaves linear on the stem, oblanceolate in the rosette. Ligules mauve, drying blue. Early summer. Alpine gravel slopes. --swAlta-seBC, US.

The range of T. spathulata Nutt. was given by Cronquist 1955 as extending north to the mountains of Alberta, while in 1957 in a monograph of the genus, Contr. Gray Herb. 183: 120-4. 1957, J.H. Beaman restricts its range to the mountains of Wyoming. We have not yet ascertained the source of the Alberta report.

13. ASTER L.

ASTER

A basic type with radiate heads, the heads, or at least the ligules, not yellow. Tegules widely varying in length, the outer successively shorter and imbricated. Pappus of fine capillary bristles.

- a. Involucre glandular Group A
aa. Not glandular but glabrous or hairy.
b. Heads discoid 24. A. laurentianus
bb. Ligulate.
c. Ligules white, sometimes pink Group B
cc. Mauve or blue to purplish.
d. Leaves gradually dimorphic, the
lower petiolate Group C
dd. Stem leaves all similar, although
the upper sometimes smaller Group D

Group A

Involucre abundantly glandular. Longer and non glandular hairs sometimes also present. Ligules mauve

to blue, except A. alpinus.

- a. Leaves large, broadly and deeply cordate
..... 1. A. macrophyllus
- aa. Broadly lanceolate to linear.
 - b. Leaves narrowly lanceolate to long linear, entire.
 - c. Monocephalous; lower leaves larger and oblanceolate 25. A. alpinus
 - cc. Usually with a few heads; all leaves narrowly linear.
 - d. Tufted; inflorescence branches with many small bracts
..... 22. A. pauciflorus
 - dd. Stoloniferous; branches bearing leaves 1-2 cm long 3. A. campestris
- bb. Leaves 1-5 cm wide, narrowly to broadly lanceolate.
 - e. Leaves conspicuously serrate; mostly 3-5 cm wide 11. A. conspicuus
 - ee. Narrower and entire to remotely serrate.
 - f. Leaves short scabrous on both faces and broadly clasping at the base 4. A. novae-angliae
 - ff. Long villous below and cuneate to a narrowly clasping base ...
..... 5. A. modestus

Group B

Ligules white, or sometimes light pink, drying white or not infrequently pale blue. Involucre glandless.

- a. Heads in a corymb.
 - b. Leaves long linear, 5 mm wide or less.
 - c. Upper leaves nearly as long as the lower 16. A. borealis
 - cc. Lower leaves many times longer ...
..... Solidago ptarmicoides
- bb. Lanceolate and much larger 23. A. umbellatus
- aa. In a panicle.
 - d. Tegules thickish, squarrose, spinulose-mucronate; stem uniformly pubescent 12. A. ericoides
 - dd. Tegules thin, straight and not mucronate; stem pubescent in lines.
 - e. Main branches widely spreading, their heads more or less turned upwards 13. A. lateriflorus

- ee. Branches ascending and their heads not particularly secund.
 f. With a thin stem and few heads, usually less than 15; leaves entire and rarely over 5 mm wide ..
 16. A. borealis
- ff. More vigorous plants with more numerous heads.
 g. Outer tegules larger and longer than the inner
 14. A. hesperius
- gg. Involucre imbricate, the outer tegules somewhat the shorter.
 h. Main stem leaves typically 1-2 dm long and remotely serrate 15. A. simplex
- hh. Shorter and entire; petiole narrow 14. A. hesperius

Group C

Ligules blue, varying from mauve to purple, mostly drying light to deep blue. Leaves dimorphic, the lower with a poorly to well defined petiole. Involucre not glandular.

- a. Tegules abundantly puberulent on back; herb 4 dm high or less.
 b. Leaves serrate 10. A. sibiricus
 bb. Leaves entire 20. A. adscendens
- aa. Tegules pubescence consisting mostly or entirely of marginal ciliation; plants usually taller.
 c. Achenes glabrous or nearly so.
 d. Leaves thickish and somewhat glaucous, the lower cuneate to a winged petiole ..
 9. A. laevis
- dd. Leaves not fleshy nor glaucous, abruptly rounded to a wingless or winged petiole; tegules less imbricated.
 e. Lower leaves narrowly ovate; stem pubescent in lines at least above the middle 2. A. ciliolatus
- ee. Lanceolate; stem glabrous except in the inflorescence ... 6. A. MacCallae
- cc. Achenes pubescent; herbage ± pubescent.
 f. Tegules not regularly imbricated, a few of the outer at least as long and as large as the inner ones, at least longer than the middle ones
 17. A. subspicatus

- ff. More or less imbricated, the outer being shorter; leaves usually narrower 18. A. occidentalis

Group D

Like the last, but the lower leaves more similar to the upper, and not petiolate, being clasping to tapered at base. Upper leaves usually somewhat shorter than the middle ones, not otherwise differentiated.

- a. Leaves densely silvery-silky, 4 cm long or less 8. A. sericeus
 aa. Leaves much longer and much less densely pubescent.
 b. Involucre 8-12 mm high; ligules 1.5-2.5 cm long; leaves broadly lanceolate 21. A. Engelmannii
 bb. Heads smaller; leaves lanceolate to long linear.
 c. Stem pubescent in lines.
 d. Peduncle lightly pubescent in lines; outer tegules shorter than the inner 14. A. hesperius
 dd. Peduncle heavily pilose; outer tegules longer than the inner 17. A. subspicatus
 cc. Stem pubescence uniformly distributed.
 e. Outer tegules much broader and longer.
 f. Stem coarsely hirsute. 7. A. puniceus
 ff. Minutely strigose or puberulent 19. A. Eatonii
 ee. Tegules imbricated, i.e. the outer ones successively shorter.
 g. Tegules glabrous dorsally; stem minutely pubescent 19. A. Eatonii
 gg. Tegules pubescent dorsally; stem pubescence coarser 20. A. adscendens

1. A. macrophyllus L. -- (Pétouane) -- Leaves conspicuously cordate, long petiolate, rather large, mostly about 1 dm across. Herbage densely glandular-puberulent throughout, varying to glabrous or hirsute below. Heads corymbose. Ligules pinkish to pale blue. Late summer and early fall. Deciduous forests, rare: Whiteshell -- NS-seMan, eUS.

After more than a hundred years of successive reports, the only tangible and firm evidence for our area

still consists of three rosette leaves collected by H.J. Scoggan in the Whiteshell Forest Reserve in 1951 (CAN). Although a sterile gathering, it seems clearly referable to A. macrophyllus on the basis of size, pubescence, glandulosity and thickened mucros. Dawson's 1875 report for the Turtle Mountain (TRT) proved to be based on a specimen of Aster ciliolatus. Reported for Norway House by Hooker 1834 and Macoun 1884 but the locality has never been confirmed and was questioned by Scoggan 1957. A Richardson collection labelled Lake Winnipeg (CAN) is correctly named, but almost certainly did not come from the locality stated. Richardson's localities are usually to be interpreted in very broad terms and his specimen was probably collected in the Whiteshell or more likely in adjacent western Ontario where the species is common. Both areas were traversed by Franklin's partly to which Dr. Richardson was attached.

2. A. ciliolatus Lindley (A. cordifolius AA.; A. Lindleyanus T. & G.) -- A common forest species with blue ligules and dimorphic leaves, the lower ovate on a long and narrowly winged petiole. Herbage villous to nearly glabrous, the stem and branches pubescent in lines. Upper leaves \pm lanceolate. Mid summer. Deciduous forests. --Mack, NS, NB-BC, US.

There has always been a fair amount of confusion between A. ciliolatus and the more eastern A. cordifolius L., the latter being reported for 5 localities in Manitoba. We have examined the specimens from Winnipeg, Miami and Grand-Rapide and were not surprised when each proved to belong to A. ciliolatus. The Swan Lake and Brandon have yet to be examined, but they are not expected to belong to A. cordifolius.

Aster sagittifolius Wedemeyer was reported by Löve 1959 from Otterburne (DAO, MSM) on the basis of what we estimate to be an exceptionally lush specimen of A. ciliolatus.

2X. A. ciliolatus X simplex -- Or perhaps A. ciliolatus x hesperius. Middle and lower leaves lanceolate, tapered to base to a winged petiole 1-4 cm long. About 4 dm high. Pubescence of the herbage varying from \pm villous (Mainly the inflorescence) to very finely scabrous (i.e. the upper leaf surfaces). Main leaves mostly 1.0-1.5 cm wide, the upper sessile, shorter and narrower by about half. Heads conspicuously bicolour, the ligules white, fading mauve, the center passing from light to deep purple. Brokenhead. --sMan.

3. A. campestris Nutt. var. campestris -- Leaves very narrow and densely glandular-puberulent in the inflorescence. Stoloniferous. Herbage finely strigose below. Leaves long linear, mostly 2-3 mm wide, the upper

gradually shorter down to about 1-2 cm. Ligules blue. Late summer. Rolling steppes. --swAlta-BC,wUS.

4. A. novae-angliae L. --Michaelmas Daisy -- Stem leaves isomegueth, lanceolate with a broadly clasping base, numerous and closely spaced. Herbage finely scabrous throughout and glandular-puberulent, especially in the inflorescence. Stem also \pm hirsute. Heads corymbose or paniculate. Ligules reddish-purple. Mid to late summer. Local in low, open spots. --NS, NB-swQ-sMan, US.

Sometimes cultivated as an ornamental; not otherwise known from west of Manitoba. It is however one of those species that may be expected to escape and become eventually naturalized in the Aspen Grove zone. Acadian occurrences are such escapes.

5. A. modestus Lindley (A. major (Hooker) Porter) -- Habit of the last but the leaves narrowed to a narrowly clasping base. Densely glandular-puberulent in the inflorescence, but mainly villous below, especially so on the stem. Heads usually few, corymbose to paniculate. Ligules deep mauve. Second half of summer. Wet to boggy spots. --(Y)-Aka, O-(seMan)-wcS-BC, US.

6. A. MacCallae Rydb. --Rather similar to A. cilio-latus but the leaves firmer and narrower and the herbage much less pubescent to glabrous. Lower leaves lanceolate, rounded to an asymmetrical base and a very long petiole, the latter very narrowly if at all winged. Upper leaves linear. Heads few. Late summer. Near mountain streams. --swAlta-seBC.

7. A. puniceus L. var. puniceus (var. oligocephalus AA.) --Pitnagen, Tea-Flower -- The coarse stem coarsely and conspicuously hispid. Usually around 1 m high. Leaves numerous, not reduced upwards, long-lanceolate with broadly auriculate clasping bases. Panicle usually ample. Tegules variable, the outer either longer or shorter than the inner, often somewhat squarrose. Ligules bluish. Mid summer. Common in marshy places. --L-SPM, NS-Alta, US--F. candidus Fern. --Ligules white. Local. --sMan, (US).

Var. oligocephalus Fern., the usual phenotype in the northeastern part of the range of the species, has fewer heads, these solitary on long peduncles which are not bracteolate, but leafy to the base of the head. It was given by Fernald 1950 as ranging to Mackenzie and Saskatchewan. In 1965 the Gray Herbarium held only one Saskatchewan sheet classified (but not revised) under this name: Breitung 866, Wallwort. There was no Mackenzie sheet, but two sheets from the upper Mackenzie basin in Alberta were also filed as var. oligocephalus, although unrevised; they came from the Slave and Embaras rivers. All these specimens were closer to our

concept of var. punicus and were so revised.

8. A. sericeus Vent. - Leaves fugaceous, those below the inflorescence usually gone by flowering time. Tufted perennial from a short, woody rhizome, 3-4 dm high. Leaves oblong-lanceolate, entire, sessile. Heads few on very leafy branches. Tegules sericeous and long, squarrose, acute. Late summer. Local on light soils. --wO-sMan, cUS.

9. A. laevis L. (var. Geyeri Gray; A. Geyeri (Gray) Howell) -- Leaves thickish, somewhat fleshy and slightly glaucous. Leaf margins scabrous, herbage otherwise glabrous. Leaves ovate to lanceolate, the upper sessile with a broadly clasping base, the middle ones oblanceolate or narrowed to a broadly winged petiole and a clasping base, the lower petiolate. Involucre strongly imbricated, often with conspicuous, rhomboid, green patches on the tegule tips. Mid summer. Frequent on better prairie soils. --Q-neBC, US.

Often subdivided in two varieties or species on the basis of degree of development of the green subterminal patch on the tegules. The specimens examined did not exhibit any morphological discontinuity on this score and both types appear to have substantially the same range.

Reports from west of us should all be carefully checked as the species appears to reach only into north-eastern B.C.: Dawson Creek (DAO), etc. Reports from southeastern B.C. were based on specimens of other species: the T. Ulke collection at Horsethief Creek (TRT) was a specimen of A. MacCallae, etc. Reports from southern Yukon are apparently based on a collection at mile 611 on the Alaska Highway. But mile 611 is in B.C. (see Aster conspicuus), about 16 miles short of the Yukon boundary.

10. A. sibiricus L. var. sibiricus (A. Richardsonii Sprengel) -- Tegules purple-margined around a green center. Loosely tufted to stoloniferous and 1-4 dm high. Leaves \pm serrate above the middle, the upper oblong-lanceolate and sessile, the lower narrowly oblanceolate and petiolate. Heads solitary or few on sub-naked peduncles. Ligules purplish, usually drying blue. Mid summer to early fall. Alpine shale slides, descending to river shores. --Mack-Aka, Alta-BC, US, Eur -- F. albinus Lepage -- Ligules white. Local: Ft. Saskatchewan -- Aka, Alta.

The more northern var. pygmaeus (Lindley) Cody tends to be lower and monocephalous, its leaves entire and narrower, not over 5 mm wide, and linear-lanceolate.

11. A. conspicuus Lindley -- A coarse and showy herb, densely glandular throughout, and with rather large

heads. Up to 1 m high. Leaves large, narrowly obovate to broadly oblanceolate, narrowed and rounded to a sessile or subclasping base. Heads few, corymbose to broadly paniculate. Ligules violet. Mid summer to frost. Light woods. --S-BC, US.

Our species was reported from Yukon by Hultén 1950, Cronquist 1955 and Boivin 1967. The only relevant specimen cited or located was an Anderson collection from mile 62 on the Alaska Highway (S), somewhere in the region of Fort St. John and about 200 miles south of the Yukon boundary. Occasional distributional reports from Yukon are, like this one, actually based on B.C. collections, including many Alaska Highway collections. Point O on the Highway is at Dawson Creek in B.C., at 55° 45'N., 120° 15'W, and the road does not cross into Yukon until mile 627. Then for the next 130 miles or so, the road repeatedly crosses the B.C.-Yukon boundary. From about mile 730 on, the road stretches diagonally across Yukon Territory until it enters Alaska at mile 1221.

12. A. ericoides L. var. commutatus (T. & G.) Boivin (A. adsurgens Greene; A. commutatus (T. & G.) Gray; A. crassulus Rydb.; A. falcatus Lindley, var. crassulus (Rydb.) Cronq.; A. multiflorus AA.; A. pansus AA.; A. polycephalus Rydb.; A. stricticaulis (T. & G.) Rydb.) -- An obvious and common prairie species with rather small heads and short white ligules. Tufted from a woody corm in dense sod, becoming long stoloniferous in disturbed soils. Herbage scabrous-puberulent to glabrous. Leaves linear. Tegules squarrose, with a large green tip and spinulose mucro. Second half of summer. Common and abundant in nearly all kinds of steppe or prairie. --Mack-Y, O-BC, US.

Two more varieties occur to the east and the west of us. Both are generally larger plants with more numerous and smaller heads on more heavily bracteolate peduncles. See Nat. Can 89: 67-70. 1962 for a detailed comparison. The eastern var. ericoides is stoloniferous and its outer tegules are 2 mm long or less. The western var. pansus (Blake) Boivin is tufted from a woody corm and its outer tegules are 2-3 mm long.

Within our area, whenever a recently built road cuts across virgin prairie thus opening part of the habitat to pioneering activities, one can usually find specimens with vigorous rhizomes radiating from an old and half disintegrated corm. Clearly, the presence of corm or stolons in var. commutatus is of ecological rather than taxonomic value. Mentions of A. pansus for our area will be found to refer the tufted phase of var. commutatus.

13. A. lateriflorus (L.) Britton -- Similar to the next two but the heads are secund on the more widely

spreading branches, and the corolla lobes more elongate, being 1.0 - 1.5 mm long. Leaves \pm lanceolate, serrate, glabrous below except for the pilose midnerve. Heads numerous and smallish, at first white, becoming bicolour with a purplish center. Late summer. Around bluffs and in light woods. --NS-sMan, US.

A. praealtus Poirlet has been reported from our area and other parts of Canada, but this could not be confirmed as all Canadian specimens seen proved to belong to other taxa. Specimens at DAO were mainly of A. hesperius. Those from WIN were mostly A. simplex with mauve ligules, some were A. hesperius, one sheet from Winnipeg Beach was A. lateriflorus, another was the hybrid A. ciliolatus X A. simplex (also at DAO). Those at CAN were mostly A. simplex.

A. praealtus stands largely intermediate between A. hesperius and A. simplex. It is generally a larger plant with a more open panicle in the manner of A. simplex, its main leaves are around 1 dm long and mostly 1.0 - 1.5 cm wide. But it resembles A. hesperius by its leaves being entire and the ligules pale mauve to light blue. The main criteria are in the leaf nervation.

In A. simplex the primary leaf nerves are readily traceable, being somewhat stronger and slightly rugose below. They are often nearly parallel to the midnerve. The interconnecting network of secondary and tertiary nerves delimitates small tissue areas that are mostly oblong and mostly 1.5-2-(6) times longer than broad. On each side of the midnerve there is a narrow strip of tissue that lies largely outside the reticulum, being merely traversed by the primary nerves.

In A. hesperius the leaf venation is essentially as in A. simplex, especially if the leaves are of the broader type. If the leaves are very narrow, the primary nerves may not be so clearly distinct, but the tissue areas will remain elongate.

In A. praealtus only the midnerve is well defined and rugose. The rest of the nervation lacks clearly defined primary nerves but consists in a reticulum which delimitates irregular polygons, most of the latter being about as long as wide, and this reticulum extends right up to the midnerve. Canadian reports of A. praealtus will generally refer to specimens of A. hesperius or of A. simplex with coloured ligules.

14. A. hesperius Gray var. hesperius (A. coerulescens AA.; A. franklinianus AA.; A. johannensis AA.; A. Oosterhoutii AA., A. salicifolius AA.) -- Perhaps our commonest and most widespread species, yet highly variable and rather nondescript. Stoloniferous and forming large colonies, often up to 1 m high. Leaves entire, lanceolate to narrowly linear, less than 1 cm wide. Heads many

in a narrow panicle. Involucre 5.0-7.5 mm high, its tegules narrow and long attenuate, their midnerve green and slightly broadened above into a narrow and elongated green tip which is usually less than 0.5 mm wide. Tegules less strongly imbricated than A. simplex, or exceptionally the outer tegules longer than the inner. Ligules white to mauve, often drying pale blue. Second half of summer and first half of fall. Open places, usually in the wetter spots. --Mack, Q-BC, US.

Two variants are worthy of notice. Some transitional specimens have the longer outer tegules of A. subspicatus but are otherwise similar to A. hesperius by the size and shape of leaf and/or pubescence of peduncle. They have been called A. hesperius var. laetivirens in Western Canada and are sympatric to A. subspicatus. A check of the eastern material shows that this transitional form is also present especially in areas where A. subspicatus occurs. Because of its sympatry with A. subspicatus we estimate that var. laetivirens is not a semi-autonomous population but merely an extreme of variation, hence not rating taxonomic recognition as a variety within our scheme of taxonomic categories, and better placed in the synonymy of A. subspicatus. Western specimens previously referred to var. laetivirens have been mostly placed in A. subspicatus, but the similar specimens from the east have been versed mainly in A. hesperius; the choice being made partly on the basis of greater similarity, partly because of what else is known to occur in the same general area.

In var. gaspensis, the second variant, tegules are more or less imbricated as in A. hesperius, but otherwise resemble A. subspicatus in being longer, heavier green and the outer ones wider, mostly 1.0 - 1.5 mm wide, and in being green throughout or nearly so. Thus the larger involucre of var. gaspensis, 8-12 mm high, tends to be darker green than the foliage. The main leaves are entire and mostly 1.0-1.5 dm long and (0.7)-1.0-1.5-(3.0) cm wide, tapered below to a narrowly clasping base, and thus resemble A. subspicatus, but they are not contracted into a broad petiolar base. The pubescence of the peduncle is of numerous decurrent lines of pubescence. Originally described from the shores of the Bonaventure river, var. gaspensis is now known from the shores of the Nottaway (Dut. & Lep. 35311 & 35342) and from Cabbage Willows (Stirrett 1127 at DAO) on the south coast of James Bay just east of the interprovincial boundary. Var. gaspensis has also been reported in Bull. Torr. Bot. Club 74: 143. 1947 as occurring around Lake Mistassini.

Aster hesperius Gray var. gaspensis (Vict.) stat. n., A. gaspensis Vict., Contr. Lab. Bot. Un. Mtr. 20:

3.1932. A. hesperius var. gaspensis f. albiflorus (Vict.) stat. n., A. gaspensis Vict. f. albiflorus Vict., Nat. Can. 71: 209.1944; A. novi-belgii L. f. albiflorus (Vict.) Boivin, Nat. Can. 94: 646. 1967.

A. johannensis Fern. was accredited to Manitoba on the basis of a series of specimens (CAN, DAO, LKHD) since revised to A. simplex or to A. hesperius.

The next three species and A. hesperius are not always clearly distinct inter se.

15. A. simplex W. var. simplex (var. ramosissimus (T. & G.) Cronq.; A. longifolius AA.; A. paniculatus Lam.) -- Like a larger phase of the last. Main stem leaves 1-2 dm long, usually 1-2 cm wide. Involucre 4-6 mm high. Ligules white; tubular flowers also white, rarely either or both pinkish. Second half of summer. Wettish open places. -- NF, NS, NB-cS, US.

In the estuary of the Saint Lawrence it gives way to a smaller plant with shorter branches, known as var. estuarinus Boivin.

The various species presented in this flora do not always differ from one another in the same manner. Usually there is a definite morphological discontinuity between closely related species and it is possible to assign to each taxon definite morphological boundaries that are not exceeded except in very unusual cases. Further, the specific criteria for most species exhibit constancy of association. Such species are said to be monothetic; they can be accurately defined by a minimum set of criteria which are both essential and sufficient for the identification of representative specimens. Taxa that do not fit within the definition above are termed polythetic. See Sneath, P.H.A., Symp. Soc. Gen. Microb. 12: 291-332. 1962, and Morse, L.E., Taxon 20: 269-282. 1971.

Polythetic taxa grade into one another and cannot be assigned precise morphological boundaries; they can be defined only in terms of a series of criteria which need not be all present; suffices to recognize such a taxon that most or nearly all its criteria be present. Often, the various criteria have unequal value and one of them may be much more important than the others. Field experience, herbarium practice and a bit of flair are helpful in dealing with such taxa and deciding which character is to be given more importance. Known distribution or ecological preferences can offer strong leads, but one most not transform the place of origin or the habitat into taxonomic criteria.

Taxa of all ranks, from form to family or higher, can be either monothetic or polythetic.

Throughout this flora we have tried to restrict the use the rank of species to monothetic taxa. Monothetic

species are presumably isolated genetically, while polythetic ones usually stand in partial isolation only. Whenever two or three taxa intergrade to form a monothetic cluster of polythetic entities, we have usually treated them as so many varieties of a single species. Hence our varieties are mostly polythetic taxa.

We have also tried to use each rank, such as species, for taxa that are roughly comparable with one another; comparable as to the kinds, manners, and degrees of differences.

The species is also the basic concept by which one initially apprehends the various elements of a flora or particular group; other ranks are usually apprehended later as collections or subdivisions of species. Hence it is essential that the species concept should correspond to the level of abstraction most easily assessable to our expected readers. In simpler words the species should be and remain a practical concept as stated in our preface.

Now, it is not possible at all times to equate species and monothetic, and at the same time define only species that are roughly equivalent and recognize nothing but practical units easily comprehended by the informed (but not necessarily specialist) reader.

Some of the richer clusters of polythetic taxa are very complex and the range of their morphological variations is so wide that they cannot possibly be held as roughly equivalent to other species in the same genus. As clusters they are also very difficult to apprehend and delimit from the non-member taxa. Practical experience has shown that such clusters are easiest to deal with when each major element is rated as a species and allowance is made for a certain amount of intergrading. Specimens with intermediate morphology may be frequent and are best treated as genuine intermediates rather than hybrids, since there is no sound basis to assume that they are significantly more heterozygous than most other individuals referred to the cluster; they merely seem to present less frequent recombinations of characters.

Aster simplex stands at the center of a very complex cluster of polythetic taxa, comprising with us A. hesperius, A. borealis, A. subspicatus and A. lateriflorus. The cluster extends into eastern Canada with the following additions A. dumosus L., A. vimineus Lam., A. Tradescantii L., A. novi-belgii L. and A. puniceus. More elements, such as A. praealtus Poiret, also occur further south.

If the cluster was much smaller, say if it comprised only A. simplex and A. borealis, we would not have hesitated to reduce it to a single species with a varie-

ty. But the cluster being as complex as it is, a different kind of solution is called for. Before one can achieve a good general view of the A. simplex cluster, one must first become acquainted with most of its major units; hence in the present case the primary unit of intellectual apprehension is not the monothetic cluster, but the polythetic and intergrading species as we have described them above and below. This is why we have retained these intergrading taxa at the rank of species.

Rydberg's floras are good examples of texts based primarily on the polythetic species. In such texts the need to recognize subspecies and varieties is greatly lessened, and most, if not all, taxa can be conveniently termed species. At the other end of the range the species as used by Gleason 1952 and Hitchcock 1969 is mostly monothetic. Fernald's Manual is a halfway house. Our approach is closer to that of Gleason and Hitchcock.

16. A. borealis (T. & G.) Prov. (A. junceus AA.; A. junciformis Rydb.) -- Like the last two, but the stem thin and wiry, the leaves long and narrow, the heads large and few. Leaves up to 2 dm long and usually less than 5 mm wide. Heads mostly 1-8. Second half of summer. Frequent in very marshy or boggy places. --Mack-Aka, NS-BC, US.

Successively this taxon has been called A. laxifolius, A. laxifolius var. borealis, A. borealis, A. junceus Aiton and more recently A. junciformis. But A. borealis appears to be the earlier and correct name. The synonymy is as follows:

A. borealis (T. & G.) Prov., Fl. Can. 1: 308, 1863; A. laxifolius Nees var. borealis T. & G., Fl. N. Am. 2: 138. 1841; A. Franklinianus Rydb., Bull. Torr. Bot. Club 37: 141. 1910; A. junciformis Rydb., Bull. Torr. Bot. Club 37: 142. 1910.

This entity was usually placed under A. laxifolius until Gray 1884 pointed out that Nees' specimens belonged to A. paniculatus (= A. simplex). As a correct name Gray then took up A. junceus Aiton, the type of the latter coming from Halifax. Now A. borealis does not occur in mainland Nova Scotia; obviously Gray's choice of name was unsound, but this escaped his attention, probably because of the relatively limited number of specimens per species in the herbaria of the last century, the distribution of any species being usually known only in very general terms.

The matter rested there for another half century until L.H. Shinnars, Am. Midl. Nat. 26: 411-412. 1941, pointed out that Aiton's specimen was unlikely to be identical with our plant since it came from outside the range of our taxon. Hence A. junceus Aiton had to be

rejected as misapplied and another name was substituted, namely A. junciformis. The latter name had been proposed by Rydberg as a western segregate of what we call A. borealis. We do not consider A. junciformis to be a tenable segregate of A. borealis and the latter is retained as the earlier name.

A. longulus Sheldon is reputed to be the hybrid A. borealis (or junciformis AA.) X A. hesperius (or caerulescens AA.) and is the source of many obscure or baffling reports for western Canada. Rydberg 1917 and 1932 reports it from Sask. and B.C.; Russell 1944 and 1954 lists collections from Pike Lake and Swift Current; Breitung 1947 and 1957, repeated by Boivin 1967, mentions McKague and Wallwort.

The type of A. longulus was the object of a detailed study by L.H. Shinnars in Rhodora 44: 338-9. 1949. It seems to be essentially similar to A. borealis except for the pubescence being more abundant in the manner of A. puniceus. Shinnars estimated that Rydberg's report was probably based on specimens of A. hesperius (or A. caerulescens AA.) His guess is partly confirmed by two Saskatchewan (CAN) collections identified A. longulus by Rydberg but which seem typical enough of A. hesperius. Russell's specimens have not been seen. Breitung quoted his collections 865, 871 and 1503; these (DAO) have been revised to A. hesperius and A. simplex. No specimen was seen from our area that we could clearly place with A. longulus as described by Shinnars.

17. A. subspicatus Nees var. subspicatus (A. ciliomarginatus Rydb.; A. foliaceus Lindley, var. Parryi (D.C. Eaton) Gray; A. frondeus (Gray) Rydb.; A. hesperius Gray var. laetivirens (Greene) Cronq.; A. Tweedyi AA.) -- Pitnagen, Tea-Flower -- A few outer tegules longer and larger than the middle and (usually) the inner ones. Stem pilose along a longitudinal strip. Leaves \pm lanceolate, the middle and lower ones often oblanceolate, the middle ones most often narrowed below to a narrowly clasping base, the margin scabrous, the limb glabrous to scabrous above. Tegules usually green to the tip, sometimes squarrose, ciliate, the involucre otherwise glabrous, but the peduncle heavily pilose. Ligules blueish. Mid summer to late fall. Near mountain streams. -- K, Aka, L-NF, NS, NB-eMan-BC, US -- Var. apricus (Gray) Boivin -- Smaller, only 2.5 dm high or less. Leaves narrowly oblanceolate. Tegules usually purple-tipped. The more common phase at higher altitudes. -- swAlta-BC, (wUS).

Var. apricus (Gray) stat n., A. foliaceus Lindley var. apricus Gray, Syn. Fl. 1,2: 193. 1884.

A. subspicatus is a difficult species, difficult to delimitate, difficult to grasp, and difficult to organize into its component variations. It is clearly related to A. hesperius into which it grades so thoroughly that the two are separable only arbitrarily. In the east it grades similarly into A. novi-belgii L. All three are however only partly sympatric and, on that basis, their distinction is considered significant. There is also some conflict as to what constitutes here the most satisfactory taxonomic boundary.

We have placed into subspicatus all those specimens with a few outer tegules green throughout and more or less equaling or overtopping the inner ones. Such specimens are also commonly separable from A. hesperius by a number of other characters none of which is quite constant. In A. subspicatus the leaves are commonly narrowly lanceolate and somewhat larger, usually around 1 dm long and 1 cm wide, the sessile blade is less narrowed at base and definitely clasping (not or barely clasping in hesperius); the larger lower leaves will be slightly contracted below into a broadly winged and ill-defined petiole. The peduncle is densely pubescent (only pubescent in lines in A. hesperius). Pappus at first white; often becoming purple-tinged. Further in A. subspicatus the outer and broader tegules are green throughout or nearly so, while the other tegules have a rather broad and intense green patch, usually around 1 mm wide, the net effect is that the involucre is as green or somewhat darker green than the rest of the foliage. In A. hesperius the tegules are narrower by half and the green patches still narrower and light green, the involucre is obviously paler than the leaves. The ligules are usually of a deeper blue in A. subspicatus.

As defined here A. subspicatus is very similar to A. foliaceus sensu Fernald 1950, except that the latter would distinguish as A. crenifolius (Fern.) Cronq. one broad-leaved collection, perhaps of hybrid origin. In Cronquist 1952 the subdivision is on a different basis and the bulk of the eastern material that we call A. subspicatus is placed in A. johannensis along with much of the eastern specimens of A. hesperius, while the broader-leaved are placed in A. crenifolius. In Cronquist 1955 the western material of what we call A. subspicatus is distributed between three species. If the leaves are not contracted at base into a broadly winged petiole, it is called A. hesperius var. laetivirens (vel sphalmate var. laetevirens). If the middle and lower leaves are contracted below, they may be called A. foliaceus if the leaves are entire or only obscurely denticulate, but A. subspicatus if the leaves are obviously serrate.

As can be gathered by Cronquist's treatment, the western phase of A. subspicatus is more variable; its lower leaves are sometimes attenuate into a barely winged petiole, more infrequently a basal rosette will be produced. Thus we are not fully convinced that the eastern and western populations should be treated as a single taxon. But being unable to establish a satisfactory morphological basis for a taxonomic distinction, we have retained them as a single taxon.

18. A. occidentalis Nutt. var. occidentalis -- Ligules blueish like the last, but the tegules imbricated, the outer being shorter and often squarrose. Mostly 2-4 dm high. Leaves narrowly lanceolate, usually less than 1 cm wide, the lower long petiolate. Heads mostly less than 10, paniculate or more often corymbose, borne on branches bearing few, if any, bracts. Second half of summer. Near shores. --(Mack), wAlta-BC, US.

Grades into the more southern var. intermedius Gray, taller, with more heads, these paniculate, and borne on branches with numerous bracts.

19. A. Eatonii (Gray) Howell (A. Mearnsii Rydb.) -- Outer tegules oblanceolate with a dark green and broad tip, glabrous dorsally and somewhat ciliate, from much shorter to much longer than the inner. Resembling the above two, but the stem leaves not dimegueth, rather narrowly lanceolate to linear. Stem pubescence also similarly fine and not in lines. Mid summer. Along creeks and rivers: Cypress Hills and Rockies. --swS-sAlta-sBC, wUS.

Reportedly the ligules vary from white to blue; but the latter colour clearly prevailed in all the Canadian specimens checked.

20. A. adscendens Lindley (A. chilensis Nees ssp. adscendens (Lindley) Cronq.; A. oblongifolius AA.; A. Richardsonii AA.; A. subgriseus Rydb.) -- Involucre similar to that of A. ericoides but the heads larger and the ligules blue. Mostly 2-4 dm high. Herbage more or less villous, especially the stem. Leaves linear, the lower much longer, narrowly oblanceolate and tapering to a subpetiolar base. Tegules much imbricated, squarrose, with a broad green tip, spinulose-mucronate. Pappus rather dark gray violet. Late summer. Steppes; uncommon. --S-seBC, wUS.

21. A. Engelmannii (Eaton) Gray -- Tegules broadly margined in purple in the upper third. Leaves soft pubescent and finely glandular below, to nearly glabrous. Heads largest, 3-5 cm across. Peduncles naked. Ligules mauve. Mid to late summer. Mountain meadows. --swAlta-sBC, wUS.

22. A. pauciflorus Nutt. -- Heads few on elongate and bracteolate peduncles, in a densely glandular-puberulent corymb. Loosely tufted, the stems 2-3 dm high, decumbent at base. Leaves narrow and long linear, much reduced upwards and grading into the small inflorescence bracts. Ligules white, sometimes fading mauve and drying pale blue. Second half of summer. Alkali flats. -- sMack, Man-sAlta, cUS.

23. A. umbellatus Miller var. pubens Gray (A. pubentior Cronq.; Doellingeria pubens (Gray) Rydb.) -- Heads white in a broad corymb. Leaves numerous, broad, lanceolate. Involucre only slightly longer than the mature seeds. Second half of summer. Moist open ground. -- (NB-Q)-O-Alta, (US).

In our variety the herbage is densely puberulent including the tegules. Also the upper leaf surface is less densely puberulent than the lower, and ligules are only 4-7 mm long. In the more eastern var. umbellatus the stem and tegules are glabrous or nearly so, the leaves are glabrous below, or at least less puberulent below than above, the involucre is sometimes shorter than the seeds, and the ligules are more variable, being commonly narrower and up to 8-(12) mm long. Budd 1957 and 1964 reports the typical variety to be common in Manitoba, but in 1969 all the specimens at SCS were correctly filed as var. pubens. The source of Budd's report remains unclear, unless it was based on such earlier reports as were discounted by Scoggan 1957.

Var. pubens is sometimes rated as a distinct species, but except for the density of pubescence, none of the diagnostic criteria amounts to much more than weak tendencies with broad zones of overlap.

24. A. laurentianus Fern. (A. angustus (Lindley) T. & G.; A. Brachyactis Blake) -- Discoid, annual. Leaves long linear, the earlier ones + fleshy and longer, but deciduous and usually lacking in herbarium specimens. Glabrous except for the scabrous-ciliate leaves. Tegules isomegueth or nearly so. Inflorescence narrowly paniculate to much diffused. Pappus often becoming much larger as the specimen dries. Late summer to frost. Saline shores, sometimes weedy. --seK-Y, PEI-BC, US, (eEur).

Young plants of A. Brachyactis Blake have larger and fleshy leaves which soon wither. These are usually lacking in herbarium specimens. The type material of A. laurentianus, a name older than A. Brachyactis, is made up of such juvenile and fleshy plants.

25. A. alpinus L. (var. Vierhapperi (Onno) Cronq.) -- With a single large head. Tufted, 1-2-(3) dm high.

Herbage densely pilose and inconspicuously glandular-puberulent throughout. Upper leaves linear, much reduced. Heads 3.5-4.0 cm across. Tegules purple-margined and almost isomegueth, thus resembling an Erigeron. Ligules usually white, varying to pink or mauve. First half of summer. Dry mountain slopes and Pine forests. -- Mack-Y, swAlta-BC, (US), nEur.

A. Tradescantii L. was credited to Saskatchewan by Macoun 1886, repeating a report by Gray 1884, but was ignored by later authors. The basis for this debatable report has not been investigated.

14. MACHAERANTHERA Nees

A minor segregate of Aster, without stolons but with a well defined taproot.

- a. Leaves at least pinnatifid..... 1. M. tanacetifolia
 aa. Serrate to entire.
 b. Leaves all or mostly entire..... 2. M. canescens
 bb. All spinulose-serrate..... 3. M. grindelioides

1. M. tanacetifolia (HBK.) Nees -- Leaves pinnatifid to tripinnatifid. Annual. Herbage abundantly glandular-puberulent, sometimes also pilose. Leaf lobes white-spinulose at tip. Heads ± corymbose. Tegules long squarrose, green above the middle, whitish below. Ligules blue. (Early summer?). Arroyos, rare. --swAlta, cUS, (CA).

Still known only from the original collection by Dawson in 1881 along the Belly River (CAN), presumably near the 49th parallel. Its occurrence in Canada has yet to be confirmed.

2. M. canescens (Pursh) Gray (M. pulverulenta (Nutt.) Greene; Aster canescens Pursh, var. viscosus (Nutt.) Gray) -- Herbage densely grayish-puberulent. Annual, diffusely branched. Leaves mainly entire, but the earlier stem leaves often remotely dentate. Tegules short-squarrose, the deflexed part deep green, densely puberulent and densely glandular, the lower part whitish and glandless. Ligules blue. Summer. Badlands and saline flats. --sS-sBC, wUS.

3. M. grindelioides (Nutt.) Shinners var. grindeloides (Haplopappus Nuttallii T. & G.; Sideranthus grindelioides (Nutt.) Britton) -- Leaves thickish and quite regularly spinulose-serrate. Perennial with tufted annual stems arising from a thick and porous-woody taproot. Leaf teeth ending in long, white, spinulose setae. Heads discoid, yellow. Tegules densely puberulent and densely glandular. First half of summer. Dry hills and badlands. --swS-sAlta, US.

The more southern var. depressa (Maguire) Cronq. & Keck is essentially a smaller plant, perhaps only a dwarf form of more arid places.

15. ERIGERON L.

FLEABANE

Closely resembling Aster and perhaps grading into it. Tegules usually isomegueth and usually very narrow, i.e. less than 1 mm wide; ligules mostly similarly narrow. Not stoloniferous but loosely tufted or taprooted and frequently with few or only one large head, usually borne on a long subnaked peduncle.

- a. Heads discoid or with very short (1-3 mm) and inconspicuous ligules..... Group A
- aa. Heads conspicuously radiate.
 - b. Less than 2 dm high and typically monocephalous.
 - c. Stem leaves numerous.
 - d. Ligules white Group B
 - dd. Ligules coloured Group C
 - cc. Foliage mainly basal, the stem leaves mostly 1-3 or none Group D
 - bb. Taller or many-headed, usually both.
 - e. Ligules white Group B
 - ee. Ligules coloured Group C

Group A

Heads discoid or merely with short and inconspicuous ligules projecting only 1-(3) mm beyond the tegules.

- a. Leaves deeply dissected 15. E. compositus
- aa. Entire.
 - b. Monocephalous and 1 dm high or less.
 - c. Involucre usually \pm 7 mm high and heavily lanate in dark blue.. 13. E. uniflorus
 - cc. Involucre smaller, 5-6 mm high, and merely pilose towards the base with hyaline hairs 21. E. Scotteri
 - bb. Normally taller and the heads many to numerous; involucre not lanate.
 - d. Involucre only 2.5-5.0 mm high and glabrous 24. E. canadensis
 - dd. Heads larger and variously pubescent or glandular.
 - e. Involucre finely glandular, little if at all pubescent; inflorescence tending to corymbose..... 22. E. acris
 - ee. Involucre hirsute and not glandular.

- f. Leaves oblong-linear, shorter than the peduncles of the lower heads 23. E. elatus
 ff. Leaves very long linear and overtopping the lower heads of the racemose inflorescence 20. E. lonchophyllus

Group B

Ligules white; stem quite leafy.

- a. Middle leaves longest 19. E. hyssopifolius
 aa. Leaves gradually reduced upwards, the upper less than half as long as the lower.
 b. Ligulate florets with a minute pappus; plants usually over 4 dm high and with many heads 18. E. annuus
 bb. Ligulate florets with normal pappus, like the inner florets.
 c. Leaves 3 mm wide or less; stem leaves all uniformly narrow, the upper merely shorter 6. E. pumilus
 cc. Lower and basal leaves larger, the upper leaves gradually narrower and shorter.
 d. Stem leaves 10-20; stems tufted from a taproot 5. E. caespitosus
 dd. Stem leaves fewer, mostly, 5-7; tufted but not forming a taproot, the caudex merely covered by fibrous roots.
 e. Leaves scabrous or pilose on both faces; upper leaves remote 4. E. asper
 ee. Leaves scabrous at margin only, glabrous below and lightly pubescent above 3. E. glabellus

Group C

Ligules coloured; stem quite leafy.

- a. Middle leaves longest, 1-3 cm long..... 19. E. hyssopifolius
 aa. Leaves much longer and the lowest longest.
 b. All or nearly all leaves auriculate-clasping at base 16. E. philadelphicus
 bb. None or only the upper leaves clasping.
 c. Ligules (1.5)-2.0-(3.0) mm wide.
 d. Stem leaves few, lightly hirsute below, more densely so above ...
 9. E. grandiflorus

- dd. Stem leaves numerous and at least the middle and lower glabrous on both faces except for the midnerve and the marginal ciliation 1. E. peregrinus
- cc. Ligules filiform, less than 1 mm wide.
 - e. Involucre pubescent; stem leaves mostly 5-7, pubescent above 3. E. glabellus
 - ee. Involucre merely finely glandular sometimes also pubescent; stem leaves much more numerous and ciliate 2. E. speciosus

Group D

Small and monocephalous with the foliage mainly basal. Less than 2 dm high. Stem leaves usually 1-3 and much reduced.

- a. Leaves finely dissected 15. E. compositus
- aa. Leaves entire to 3-toothed at apex.
 - b. Ligules yellow 11. E. aureus
 - bb. White or pink to mauve or blueish, sometimes yellowish in drying.
 - c. Involucre 9-13 mm high, heavily lanate.
 - d. Ligules white; some leaves 3-toothed at apex 12. E. lanatus
 - dd. Ligules coloured; all leaves entire 9. E. grandiflorus
 - cc. Involucre only 4-8 mm high and not lanate, although sometimes heavily pilose.
 - e. Leaves mostly spatulate, varying from narrowly obovate to oblanceolate.
 - f. Some leaves 3-5-toothed at apex 14. E. pallens
 - ff. All entire.
 - g. Long stoloniferous; herbage strigose 17. E. flagellaris
 - gg. Tufted and the stem pilose with spreading hairs.
 - h. Ligules \pm 3 mm long and very narrow; plant usually 3-5 cm high 21. E. Scotteri
 - hh. Ligules longer and \pm 1 mm wide; plant about 1 dm high 10. E. Arthuri
 - ee. Leaves long linear; ligules broad.
 - i. Leaves 2 cm long or less; stem usually scapose 8. E. radicans

- ii. Leaves much longer; stem bearing a few leaves 7. E. ochroleucus

1. E. peregrinus (Pursh) Greene var. scaposus (T. & G.) Cronq. (E. callianthemus Greene; E. salsuginosus AA.) -- Ligules broad, 1.5-3.0 mm wide, like an Aster. Usually monocephalous and (1) -3-4(7) dm high, with 5-10 oblong to oblanceolate leaves. Involucre densely and finely glandular. Mid summer. Open woods in the mountains. --Y-(Aka), swAlta-BC, wUS.

In the more western typical phase the involucre is merely villous, not glandular, and the foliage tends to be more ample.

2. E. speciosus (Lindley) DC. var. speciosus -- Resembling the last, but the blue ligules narrow and the leaves more numerous. Heads solitary or more commonly 3-5. Herbage nearly glabrous except in the inflorescence, but the leaves ciliate. Ligules mauve, often drying yellowish. Mid summer. Open places in the mountain. --swAlta-sBC, US, (CA) -- Var. conspicuous (Rydb.) Boivin (E. subtrinervis Rydb. var. conspicuous (Rydb.) Cronq.) -- More pubescent. Stem somewhat hirsute. Leaves somewhat pubescent on both faces, more densely so along the midnerve. --swAlta-sBC, nwUS.

Stat. n., E. conspicuus Rydb., Mem. N.Y. Bot. Gard. 1: 400. 1900.

3. E. glabellus Nutt. var. glabellus (var. pubescens Hooker; E. anodontus Lunell; E. asper Nutt. var. pubescens (Hooker) Breitung, f. roseata (Lunell) Breitung; E. Drummondii Greene; E. oligodontus Lunell; E. speciosus AA.) --A common and showy, tufted prairie species, mostly 3-4 dm high, with few heads and pink filiform ligules. Leaves glabrous below, scabrous at margin, lightly pubescent above. Upper leaves 1/3-1/2 as long as the lower. Involucre hairy but not glandular. Mid summer. Frequent on better prairie soils. -- Mack, Man-BC, US.

There is a fair amount of confusion in the herbaria and in the botanical literature about this and the next species. We have therefore based our distributions solely on the specimens examined for each entity.

At DAO all the Yukon and Alaskan specimens under E. glabellus and its synonyms have been revised to E. asper. We are assuming that the material in other herbaria should be similarly revised.

Further south our typical plant is replaced by a var. viscidus (Rydb.) stat. n., E. formosissimus Greene var. viscidus Rydb., Bull. Torr. Bot. Club 28: 24. 1901, inconspicuously glandular on the involucre, the glandulosity being often somewhat hidden under the copious and longer pubescence.

4. E. asper Nutt. (var. pubescens AA., f. roseata AA.; E. glabellus var. pubescens AA.; E. oblongeolatus AA.) -- Like the last, with which it is sometimes confused, but more pubescent, the ligules white, the upper leaves more reduced, and flowering earlier. Leaves scabrous-pubescent to coarsely pilose on both faces. Upper leaves distant and much reduced, down to about 1 cm. Ligules sometimes fading pink. Early summer. Common on prairies. --Y-Aka, Man-BC, US.

Because the ligules tend to fade and dry pink, the latter colour is more common in the herbarium than in the field.

5. E. caespitosus Nutt. (E. condensatus AA.) -- Rather resembling E. asper, but smaller and in tufts from a taproot, the stem leaves more numerous, the upper not reduced so much. Taproot thickish, branched at top. Stems 2 dm high or less, mostly monocephalous. Pubescence denser and shorter than in the next and the last two, the hairs mostly 0.3-0.5 mm long. Ligules white. Mid summer. Common on steppes and hillsides. --Y-Aka, Man-BC, US.

E. Engelmannii Nelson was reported for southern Saskatchewan by Budd 1957 and 1964. It proved to be based on a Nashlyn (DAO, SCS) collection revised to E. caespitosus by Breiting in 1955. We concur.

6. E. pumilus Nutt. var. pumilus -- Daisy -- Forming an obvious series with the last three species. Leaves narrowest, long linear, and less than 3 mm wide. Tuffed from a taproot. Mostly around 1 dm high. Herbage villous throughout, especially so on the stem. Tegules lightly hirsute. Ligules white. Late spring and early summer. Sandy hills. --sS-sAlta, US.

The more western var. gracilior Cronq. is a bigger plant, commonly about twice as tall and often with 5-8 heads; pappus of shorter and often of squamiform setae.

7. E. ochroleucus Nutt. var. Scribneri (Canby) Cronq. -- A small monocephalous type with narrow leaves like the last, but the pubescence somewhat lanate at least on the involucre, the ligules usually lavender and the tegules with squarrose purplish tips. Basal leaves about half as high as the stem, the latter with few leaves, mostly 3, and much reduced. Heads showy. Involucre about 7 mm high. Early summer. Alpine meadows and summits. --swAlta, US.

Reports for the Cypress Hills, see Brittonia 6: 189. 1947, are to be discounted. They have not been confirmed by modern collections and the sole justifying sheet located, Macoun, Cypress Hills, June 28, 1894 (MO), has since been revised to E. radicatus.

Typical var. ochroleucus is a taller plant, 1-4 dm high, with larger and more numerous stem leaves.

8. E. radicans Hooker (E. peucephyllus AA.) -- Basal leaves narrow and rather short, less than 2 cm long and not over 3 mm wide. Tufted, subscaPOSE, less than 1 dm high. Somewhat lanate towards the base of the involucre, otherwise lightly strigose throughout. Involucre about 5 mm high. Ligules \pm 2 mm wide. Early summer. Rare on dry ridges and hilltops: Old Wives Creek, Eastend, Wood Mountain, Cypress Hills, Jasper Lake and Moose Mountain Creek in Alberta. --swS-swAlta, wUS.

9. E. grandiflorus Hooker -- Ligules wide, and generally like a small E. peregrinus, but the herbage long pilose throughout, including the involucre. Only 1-2 dm high. Leaves not so wide, narrowly oblanceolate to linear, densely long ciliate, the stem leaves about 5. Ligules often turn yellowish in drying. Early summer. Alpine prairies. --wF, Mack-Aka, swAlta-eBC.

10. E. Arthurii Boivin (E. acris var. asteroides X aureus AA.; E. uncialis var. conjugans AA.) -- Similar in habit and size to the next, but the ligules narrower and not yellow. Also approaching E. Scotteri but generally larger, especially the ligules. Stem \pm 1 dm high. Rosette leaves spatulate to oblanceolate, up to 1 cm wide. Stem leaves (1)-2-(4), much smaller, the upper obscurely glandular. Pubescence and glandulosity as in the next species, except that the involucral pilosity is not so dense and the stem and the basal leaves are similarly pilose. Head solitary or rarely with a smaller head arising from the upper axil. Involucre 6-7 mm high, appressed, the tips purple. Ligules about 1 cm long and \pm 1 mm wide, at first white, soon turning rose (or perhaps light mauve), but the half-grown ligules often yellowish. Mid summer. Alpine gravel slopes. -- swAlta-swBC.

Sp. n.; E. acris X aureus sensu Cronquist 1947 et sensu Boivin 1967. Perennis, caespitosus, decimetalis et monocephalus. Pilosus omnino nisi ad summas tegularum ubi minute glandulosus. Folia rosettae 2-10 cm long, ad 1 cm lat., a spatulatis oblanceolata. Caulis pilosa et \pm glandulosa, dense et minute glandulosa in peduculo, foliis (1)-2-(4). Involucrum appressum, 6-7 mm alt. Tegulae ad basas pilosae et obscure glandulosae, ad summas purpureae et minute glandulosae. Ligulae circa 50, in primis albae, deinde roseae (vel forsan pallide lilacinae), \pm 1 cm long., \pm 1 mm lat. Flores disci lutei. Pappus 4-5 mm. Semen puberulum. Typus: Calder & Holm 24064, Twin Cairn Peak, B.C., gravelly steep slope about 7950, July 29, 1959 (DAO; isotypi: ALTA, CAN). Paratypi: Calder & Holm 24067, eodem (DAO); Calder & alii 19698 A, Quiniscoe L., Keremeos, B.C., Aug. 3, 1963 (DAO); Taylor & Ferguson, Lakit Mountain, B.C., July 15, 1958 (DAO); E. Scamman 6710, Mt. Assiniboine, B.C., Aug. 7-17, 1952

(CAN); Macoun 70350, Mount Forget-me-not, Alta., July 16, 1897 (CAN); D. Pelluet 274, Banff, Cascade Mt., Aug., 18, 1916 (CAN); D. Pelluet 210, Banff, Mt. Inglismaldie, July 17, 1916 (CAN).

A putative hybrid of acris X aureus was reported in Brittonia 6: 230. 1947 on the basis of three collections of which we have yet seen only one, the Forget-me-not specimen cited above.

So named after Dr. Arthur Cronquist, author of an excellent monograph of the genus for north America and apparently the first to have noticed the morphological originality of this taxon.

11. E. aureus Greene -- Ligules yellow, fading brown, 5-7-(10) mm long, (1.5)-2.0-(2.5) mm wide. A small monocephalous type, the stem usually unifoliate, obscurely glandular and spreading pilose. Rosette leaves more densely pubescent than the stem and with shorter and somewhat appressed hairs. Involucre (6)-7-(8) mm high, appressed to irregularly long squarrose, lightly to heavily long lanate with white to purple-black hairs. Summer. Alpine prairies and summits -- swAlta-BC, nwUS.

12. E. lanatus Hooker -- Heavily long-lanate, especially the involucre, with hairs up to 2-5 mm long. Basal leaves narrowly oblanceolate, some of them 3-toothed at apex. Ligules 1-3 mm wide, usually white. Mid summer. High alpine on talus slopes and summits. --swAlta-seBC, US.

A recent range extension to Lake Kluane in southwestern Yukon in Can. Field-Nat. 82: 114-5. 1968 proved to be based on a specimen of E. purpuratus var. dilatatus.

The monocephalous Aster alpinus is habitually similar to E. aureus and E. lanatus, but the ligules of A. alpinus are white to pinkish and 1-2 mm wide, the tegules coarser, 1-2 mm wide, tending to oblanceolate and less than 9 mm long, the leaves entire, heavily pilose and oblanceolate.

13. E. uniflorus L. var. unalaschkensis (DC.) Boivin (E. humilis Graham; E. unalaschkensis (DC.) Vier.) -- Involucre heavily lanate with dark bluish-tinted hairs, the dark blue hue being due to the deep purple cross-walls of the hairs. Less than 1 dm high and monocephalous. Ligules filiform, 3 mm long or less, white to bluish. Second half of summer. Tundra and alpine slopes. --G-Aka, L, nQ, nMan, swAlta-BC, US, Eur.

Stat. n., E. pulchellus var. unalaschkensis DC., Prodr. 5: 287. 1836. In the var. eriocephalus (J. Vahl) stat. n., E. eriocephalus J. Vahl ex Horn., Fl. Dan. 13: 2299. 1840, the involucre is lanate in white. The latter is more strictly arctic and the more southern records from B.C. are to be discounted; all B.C. specimens at

DAO, QK and MTJB, including the mount Avalanche sheet cited by Macoun 1896, have been revised to var. unalaschkensis, while other herbaria visited, including UBC and V, held no specimen at all.

There is also in B.C. a colour form that is likely to turn up in Alberta and could create some confusion: E. uniflorus var. unalaschkensis f. pallidus (Cronq.) stat. n., E. humilis f. pallidus Cronq., Brittonia 6: 239. 1947, in which the involucreal pubescence is white or essentially so. Such plants have the color of var. eriocephalus but the head size and appearance of var. unalaschkensis. In the latter the involucre is purple black, (6)-7-(9) mm high, and the tegules are all appressed or the tips sometimes lax. In var. eriocephalus the involucre is deep purple, more densely lanate, 8-9-(10) mm high, and laxer, the outer tegules tending to be long squarrose.

14. E. pallens Cronq. -- Leaves spatulate, mostly 3-toothed at apex. Low and monocephalous. Herbage long villous and inconspicuously glandular throughout, becoming yellowish lanate on the involucre. Ligules usually white. Mid summer. High alpine on shale slides. --swAlta-seBC.

Known to us only from Mount Saskatchewan (DAO), the Hanging Glacier (NY), Lake Louise (CAN), Shovel Pass (CAN), Bee Mountain (CAN), and Mount Copperstain (UBC), the latter two from B.C. We have not seen the Mount MacDonald collection.

The range was recently extended northward into western Mackenzie on the basis of a series of specimens (DAO) originally identified as E. purpuratus Greene, later revised to E. pallens and cited as such by Cody 1969. The justifying specimens have entire leaves, their involucre is heavily pilose with + purplish hairs, their papus turn purplish at anthesis, etc.; they do not differ substantially from E. purpuratus except for their consistently broader leaves which give them a superficial similarity to the closely related E. pallens. They apparently represent a hitherto unrecognized geographical variant and may be known as follows:

E. purpuratus var. dilatatus var. n., foliis latioribus et modo brevioribus, a spatulatis oblanceolatis, praecipue 2-3 mm lat. Typus: Kvale & Haggard 131, Mackenzie Mtns, Redstone River, dry soil and talus, 4 July 1963 (DAO). Paratypes from the Mackenzie Mountains as cited by Cody and also from the Quill Creek area (DAO) in Yukon. The latter was reported as E. humilis in Bot. Not. 109: 204. 1956.

15. E. compositus Pursh (var. glabratus Macoun, var. discoideus AA.: E. trifidus Hooker) -- Leaves deeply dissected into narrow segments, tripartite to tripartitid. 2 dm high or less and monocephalous. Stem

leaves few, linear, entire, reduced. Ligules usually white, variable in length. Late spring and early summer. Infrequent in open places, including steppes and alpine prairies. --G-F-(K)-Mack-Y-(Aka), NF, seQ, sS-BC, US --F. discoideus (Gray) Vict. & Rouss. --Heads discoid. --Y, NF, seQ, swS-BC, US.

Many varieties have been described. We are inclined to regard them as ecologically conditioned variants: plants from lower altitudes or from along watercourses tend to be taller, their leaves are more divided, the lobes longer, etc.

16. E. philadelphicus L. var. philadelphicus (E. purpureus Aiton) -- Most stem leaves clasping at base. Shallow-rooted and \pm biennial. Herbage long villous or hirsute. Inflorescence corymbose. Ligules pink or mauve, filiform, numerous. Early summer. Wettish ground. --swMack-Y, NF, NS-(PEI)-NB-BC, US.

Hultén 1950 extended the range to southern Yukon, but his only cited specimen was from Liard Hot Springs in northern B.C. We have however checked the following Yukon collection: E. Schoff, W. Dawson, August 1904 (TRT). A collection from Old Crow is also cited by Hultén 1967.

The more eastern var. Provancheri (Vict. & Rouss.) stat. n., E. Provancheri Vict. & Rouss., Contr. Inst. Bot. Un. Mtr. 36: 58. 1940, from the estuaries of the Saint Lawrence and of the Hudson, is smaller and essentially glabrous.

17. E. flagellaris Gray -- With long and conspicuous superficial stolons. Mostly 1-2 dm high and the stolons about as long as the stem. Rosette leaves more numerous, spatulate-oblongate. Stem leaves only 1-2 -(3) and much smaller, oblongate, similar to the stolon leaves, but the latter more numerous. Mid summer. Mountain meadows in Waterton. --swAlta-sBC, US.

18. E. annuus (L.) Pers. (E. ramosus (Walter) BSP.; E. strigosus Muhl. var. septentrionalis (Fern. & Wieg.) Fern.) -- Sweet Scabious, White Top -- Stem ridged with 3 lines of decurrence from each leaf, one for the mid-nerve and one for each margin. Shallow-rooted and \pm biennial. Herbage rough-pubescent. Leaves entire or serrate, attenuate to a sessile base, the lower petiolate. Inflorescence becoming a lax and broad corymb. Central head larger, flowering first, eventually overtopped by the newer heads. Ligules white, filiform, numerous. Mid summer. Open woods. --NF, NS-BC, US, Eur.

Usually subdivided in two species on what seems to us to be an essentially arbitrary basis.

19. E. hyssopifolius Mx. var. hyssopifolius - - Wild Daisy -- Heads few or only one, borne on a very

long and subnaked peduncle. No basal leaves, lower leaves smaller, middle leaves linear, mostly 2-3 cm long, about 3 mm wide and subtending short sterile shoots, thus the plant is much more heavily leafy towards the middle. Stem glabrous to sparsely pubescent. Mid summer. River banks and wet openings in coniferous forests. --K-Mack, NF, NS, NB-Alta-(neBC), US.

A highly localized sinolaurentian variant, var. villicaulis Fern., is a smaller plant, abundantly pubescent on the stem, the bracteolate peduncle about as long as, or longer than, the leafy part of the stem.

20. E. lonchophyllus Hooker (E. minor (Hooker) Rydb.) -- Inflorescence becoming racemose. Shallowly rooted biennial. Stem hirsute. Leaves commonly about 3 mm wide, glabrous on both faces, long ciliate towards the base, linear, the lower very long linear, but some of the basal ones oblanceolate and petiolate. Ligules white, \pm 1 mm long. Mid to late summer. Pioneer on wet, disturbed soils. --K-Aka, Q-BC, US, SA.

21. E. Scotteri Boivin (E. acris var. asteroides X uniflorus var. unalaschkensis AA.; E. acris var. debilis X humilis AA.; E. Evermannii AA.; E. vagus AA.) -- Small and monocephalous, similar to E. pallens and E. uniflorus, but much less pubescent than either, at least the larger leaves glabrous above. Perennial, 2-6-(12) cm high, the stems few or commonly solitary. Leaves entire, ciliate, \pm pubescent dorsally. Stem heavily pubescent with hairs \pm 0.5 mm long, also finely glandular. Involucre rather small, only 5-6 mm high; tegules ciliate, densely and finely glandular on back, densely pilose at base, sometimes sparsely pilose along the midnerve. Ligules pink, \pm 3 mm long, \pm 0.3 mm wide, rare alpine in Banff and Jasper parks. --swAlta-seBC.

Sp. n. sectionis Trimorphaeae. Perennis. Radix brevis, caudicibus nullis. Caulis saepius solitarius, 2-6-(12) cm alt., dense et minute glandulosus, valde pilosus, pilis \pm 0.5 mm, lucidis. Folia rosettae petiolata, a spatulatis anguste oblanceolata, ciliata et inferne \pm pubescentia, superne glabrescentia. Involucrum 5-6 mm alt., viride. Tegulae circa 0.5 mm lat., sensim acuminatae. Ligulae roseae, \pm 3 mm long., (0.2)-0.3-(0.5) mm lat., 40-100 in capite. Flores filiformes perpaucae. Flores disci 4-5 mm long., tubo \pm 1 mm long., luteae, lobis brunnescentibus vel purpurascensibus. Pappus 3-4 mm long. Semen \pm 2 mm long., anguste lanceolatum, compressum, puberulens.

Typus: G.W. Scotter 9796A, Alberta, Jasper Nat. Park, Maligne Lake, alpine, Aug. 8, 1958 (DAO). Paratypes: G.W. Scotter 9776 & 9801, eodem (DAO); J.A. Calder 24031, Lake Agnes, 1959 (DAO); L. Jenkins 7809, Jasper

Park, from Maligne Lake to Lorraine Lake, el. about 6000 feet, common among boulders on open slope, Aug. 6, 1957 (DAO); F.J. Hermann 12865, mossy north shore of Lake Louise, alt. 5,700 ft., July 18, 1956 (ALTA, CAN); N.E. Sanson 1030, Larch Valley, Alta., 1923 (NY); J. Macoun 11002, 78762, B.C., Kicking Horse Lake, 1886 (CAN, NY); Bostock, Yoho, B.C., 1927 (DAO); Calder & Holm 24066B, 24067, Twin Cairn Peak, BC., July 29, 1959 (DAO).

From its relatives our new species may be distinguished by a number of characters, such as the very small involucre. Its very narrow and short ligules will readily separate it from most other small monocephalous species in our area. Its light pubescence also readily sets it apart from most other small alpine species. The length of the pappus will separate it from small and monocephalous specimens of E. acris. In the latter ligules are usually white and the disk florets are conspicuously overtopped by the pappus while in E. Scotteri the pappus is shorter and slightly overtopped by the disk florets.

Despite its assignment to section Trimorphaea, it seems that E. Scotteri is most closely related and quite similar to E. uniflorus. However the latter is heavily tomentose on the involucre with much longer hairs, its tegules are longer and purplish, and its pappus is somewhat longer than the disk florets.

Though rarely collected, this new entity has been known for quite some time and has gone through a surprisingly elaborate series of avatars.

The first collection may have been that of Macoun at Kicking Horse Lake in 1886; it was identified as E. acris (CAN) or E. uniflorus (NY) and reported as the latter the following year. But Macoun in 1897 mentions it again as his only specimens of E. alpinus. In 1923 a Sanson collection from Larch Valley was also identified, probably at NY, as E. uniflorus. On page 239 of his monograph Cronquist refers casually to hybrids of E. acris var. debilis X humilis. This report was investigated in 1965 and turned out to be based on the above two collections. Borrowed and examined in 1966, they proved to be rather intermediate morphologically to the postulated parents and were incorporated in our Enumération of 1966 as E. acris var. asteroides X uniflorus var. unalaschkenensis. Hermann collected it at Lake Louise in 1957, identified it to the partly glabrous E. Evermannii, and distributed duplicates with a note that it was new to Canada. His collection was the basis for a last minute inclusion of the latter name in the Flora of Alberta of Moss 1959, and in our Enumération of 1966. A Jenkins collection submitted for identification in 1958 was estimated to be an unusually depauperate specimen of E. acris and was so identified.

There is also in one of the Botanical Congress guide books a mention by Porsild 1959 of E. vagus from Mt. Temple. In our 1962 survey of the genus at CAN there were no specimens under this names and a cursory check in 1969 and 1971 gave similarly negative results. In the absence of justifying specimens, noticing the absence of the putative hybrid and of E. Evermannii from Porsild's list, considering that E. vagus would be far out of range in the Canadian Rockies, and considering that it is generally similar to E. Scotteri in the same manner as the latter is similar to E. Evermannii, we are tentatively referring the Canadian report of E. vagus to E. Scotteri.

Thus, this attractive little species has already accumulated a complex history and a rather large and unwieldy series of conflicting identifications.

22. E. acris L. var. asteroides (Andrz.) DC. (var. debilis Gray; E. angulosus Gaudin var. kamtschaticus (DC.) Hara; E. droebachensis O. Mueller) -- Farewell-to-Summer (Vergerette) -- Ligules short and inconspicuous like the last two and the next, but the involucre minutely glandular. Herbage otherwise ± pubescent or hirsute. Leaves oblanceolate to linear, up to 1 cm wide. Heads rarely solitary, usually few in a variable inflorescence, commonly corymbose, sometimes paniculate or thyrsoid. Peduncles widely spreading. Mid summer. Wettish open spots in coniferous forests. -K-Aka, L, NB-BC, (US, Eur).

Many other varieties also occur in Eurasia.

23. E. elatus (Hooker) Greene (E. acris L. var. elatus (Hooker) Cronq.) -- Obviously related to the last. Involucre hirsute, not glandular. Heads only one or few on nearly erect peduncles in a racemose inflorescence. Usually smaller and with fewer stem leaves. First half of summer. Open wet ground on light soils. --K-Aka, L-NF, Q-Man-(S)-Alta-BC.

Smaller specimens may be monocephalous and should not be confused with E. uniflorus. In the latter the somewhat larger head is very heavily lanate with flexuous hairs mostly 2-3 mm long. But in E. elatus the involucral pubescence is much less dense and the shorter hairs are all or mostly under 1 mm.

24. E. CANADENSIS L. var. CANADENSIS (Conyza canadensis (L.) Cronq.; Leptilon canadense (L.) Britton) -- Fireweed, Horseweed -- (Fausse Camomille, Herbe des Français) -- Heads small and usually very numerous in a ± cylindrical inflorescence. Annual. Leaves numerous, linear. Herbage villous. Mid to late summer. Frequent on disturbed soil, especially in sandy or gravelly. -- Mack, (NF)-SPM, NS-BC, US, SA, Eur, (Oc).

Reputedly native in Canada but we are unconvinced. From coast to coast we have often come across it; every time it had the usual weedy behavior of an alien invading disturbed soils. Nowhere did it recur regularly as a normal component of a natural habitat.

A coastal plain variant, var. pusillus (Nutt.) stat. n., E. pusillus Nutt., Gen. 2: 148. 1818, is glabrous or nearly so and its tegules are purple-tipped.

16. PSILOCARPHUS Nutt.

With the general presentation of an Antennaria, or better a Gnaphalium, but the leaves opposite. Pappus lacking. Heads without involucre but subtended by a few foliage leaves. Each floret enclosed by a woolly bract.

1. P. elatior Gray -- Woolly Heads -- Woolly annual resembling a Gnaphalium with opposite leaves. Less than 1 dm high, simple to dichotomously branched. Heads small, rounded, sessile, overtopped by a number of subtending foliage leaves. Mid summer. Dried slough bot-toma, rare: Redcliff. --swAlta-swBC, nwUS.

17. ANTENNARIA Gaertner

PUSSY-TOES

White-woolly herbs with dioecious flowers. Heads discoid, but rather showy because the tegules are petaloid in the upper half, white-woolly in the lower half. Pappus of bristles, these somewhat clavate in the staminate plants.

This genus has been much studied by various taxonomists for some three quarters of a century now and we have not yet had a chance to evaluate some of the many described entities. At least the following have been reported for Alberta and should eventually be added to our text either as additional taxa or as additional synonyms.

Antennaria acuta Rydb. (= Rydberg 1917).

Antennaria albescens E. Nelson (= Rydberg 1917).

Antennaria alborosea Pors. (= Porsild 1950).

Antennaria Sansonii Greene (= Rydberg 1917).

- a. Inflorescence an open raceme 5. A. racemosa
- aa. Inflorescence a corymb, or sometimes a solitary head.
 - b. Stem very short or vestigial, not overtopping the basal leaves 17. A. dimorpha
 - bb. Much taller.
 - c. Basal and lower leaves 3-15 cm long, lanceolate to linear, acute Group A
 - cc. Shorter and relatively wider, usually rounded at tip.

- d. Tegules coloured in the upper half, greenish, straw, brownish or pink ...
..... Group B
- dd. Milky-white to light sulphur-yellow.
 - e. Leaves rather large, the larger ones over 5 mm wide and usually glabrous or glabrescent above ..
..... Group C
 - ee. Rather narrow, rarely over 5 mm wide, grayish or whitish tomentose, above Group D

Group A

Tufted or stoloniferous but the stolons buried. Rather large species with the leaves all or mainly cauline. Rosette leaves, if present, erect.

- a. Tegules glabrous to the base or the outer ones somewhat tomentose near the base..... 3. A. luzuloides
- aa. Tegules heavily tomentose in the lower 1/3; heads larger.
 - b. Tufted; upper stem leaves at least half as long as the lower 4. A. lanata
 - bb. Stoloniferous; upper stem leaves much reduced and many times shorter than the lower.
 - c. Tegules not white at tip, or the white tip less than half the length of the tegule 1. A. pulcherrima
 - cc. White tips longer, more than half the length of the tegule 2. A. anaphaloides

Group B

Tegule tips variously coloured. Rosette-forming species.

- a. Tegules pink 11. A. rosea
- aa. Straw-coloured to brownish or greenish.
 - b. Tegules pale to dark brown above the middle.
 - c. Involucre 6-7 mm high.
 - d. Basal leaves 5-10 mm wide
..... 15. A. Russellii
 - dd. Narrower 18. A. alpina
 - cc. Involucre only 4-5 mm high; plants smaller 16. A. umbrinella
 - bb. Tegules with dark-coloured and greenish tips.
 - e. Involucre 8-10 mm high; leaves very narrowly oblanceolate.
 - f. Herbage grayish-tomentose ...
..... 20. A. angustata
 - ff. Green and nearly glabrous ...
..... 21. A. glabrata

- ee. Heads smaller, the involucre only
4-6-(7) mm high; leaves oblanceolate,
mostly 3-5 mm wide.
g. Typically monocephalous; tegules
strongly squarrose
..... 19. A. monocephala
gg. Mostly with 3-5 heads; tegules
appressed 18. A. alpina

Group C

Rosette forming species. Tegule tips all, or at least the inner, white, or in one species light sulphur-yellow. Basal leaves rather broad, the larger ones mostly over 1 cm wide and mostly glabrous or glabrescent above.

- a. Involucre 4-7 mm high.
b. Basal leaves ovate or obovate, 1-2 cm wide when full grown 7. A. Denikeana
bb. Spathulate or oblanceolate and all or mostly 0.5-1.0 cm wide 9. A. neodioica
aa. Involucre 7-11 mm high.
c. Rosette leaves 1.5-5.0 cm wide ... 6. A. Parlinii
cc. All or mostly narrower.
d. Basal leaves cuneate-oblanceolate, gradually narrowed at base, not distinctly petiolate; new rosettes not developed until fruiting time
..... 8. A. Howellii
dd. Blade \pm obovate and abruptly narrowed to a winged petiole; new rosettes present at flowering 9. A. neodioica

Group D

Like the last, but the leaves more tomentose. Whittish or grayish above, and narrower, all or mostly less than 5 mm wide.

- a. Heads rather large; involucre 7-10 mm high
..... 13. A. aprica
aa. Heads smaller; involucre 5-7 mm high.
b. Reduced plants, less than 5 cm high
..... 13. A. aprica
bb. Usually well over 1 dm high.
c. Basal leaves obovate-spathulate, the blade less than 3 times as long as wide 10. A. parvifolia
cc. Narrowly oblanceolate.
d. Middle and upper stem-leaves ending in a scarious flat and glabrous appendage; tegule tips dirty white...
..... 14. A. isolepis

dd. All or nearly all stem-leaves subulate at tip; tegules tips white ...

..... 12. A. corymbosa

1. A. pulcherrima (Hooker) Greene -- Our largest species and with the longest foliage leaves. Stoloniferous, but the stolons much elongate and underground, the plant thus not carpet-forming. Tomentose throughout. Stem 3-6 dm high. Lower and basal leaves petiolate, narrowly lanceolate, the blade 5-15 cm long. Involucre 7-9 mm high. Tegules dirty green or dirty brown to white at tip, the basal part green and white-tomentose, the middle part dark brown. Just before mid summer. Wet and open clay soils in the coniferous forest regions. --K-Aka, Q-BC, wUS, (Bur).

2. A. anaphaloides Rydb. --Very much like the last but somewhat smaller and the tegules broader and more conspicuous, the white tips being more than half the length of the tegule. Involucre smaller, 5-7 mm high. Early summer. Mountane prairies and open Lodgepole woods: Cypress and Rockies. --Aka, swS-BC, nwUS.

3. A. luzuloides T. & G. -- Resembles the last two, but the heads smaller and less pubescent. Stem 2-4 dm high. Short stoloniferous. Leaves less than 1 cm wide, mostly linear. Heads numerous. Involucre \pm 4 mm high, lanate at the very base only. First half of summer. Rocky alpine slopes in Waterton. --swAlta-sBC, nwUS.

4. A. lanata (Hooker) Greene -- With the habit of the last 3 and with elongate lanceolate leaves, but loosely tufted and loosely lanate throughout, especially so in the inflorescence. 1-3 dm high. Ligule tips squarrose, brown to greenish black. Mid summer. Alpine meadows. --swAlta-BC, nwUS.

5. A. racemosa Hooker -- Inflorescence a loose raceme, the lowest peduncle 2-3 cm long. With long superficial stolons. Basal leaves ovate, green above and mostly 2-3 cm wide. Stem leaves oblong-lanceolate. Early summer. Montane Pine woods. -- swAlta-BC, nwUS.

6. A. Parlinii Fern. var. Parlinii (A. munda Fern.) -- Rosette leaves rather large, obovate, mostly 2-3 cm wide. 2-4 dm high. Heads 4-8 in a rounded corymb. Long stoloniferous and forming dense carpets, the new rosettes not fully grown till fruiting time. Dry open places; rare: Indian Bay. --NS, Q-seMan, US.

In the magnilacustrine var. Farwellii (Greene) Boivin the leaves are cuneate obovate, \pm truncate, and the pappus is somewhat shorter, about 6 mm long.

7. A. Denikeana Boivin (A. plantaginifolia AA.) -- Similar to A. Parlinii, but the heads smaller and the

leaves permanently grayish tomentose above. Involucre only 4.0-4.5 mm high. Late spring. Dry fields. -- sMan.

A. plantaginifolia has often been used sensu amplo, especially by the older authors, and the justifying sheets must be examined in each case when attempting to dispose of old records. Its Canadian distribution appears to be restricted to southwestern Quebec and southern Ontario. Of the old collections by Dawson's party we have examined sheets from Emerson (TRT) and Dufferin (TRT). They were revised partly to A. neodioica, partly to A. Howellii var. campestris. Old collections by Bell (QK) have been revised partly to A. neodioica, partly to A. Howellii var. athabascensis. The more recent report of Scoggan 1957 was partly based on A. Denikeana.

8. A. Howellii Greene var. Howellii (A. neglecta Greene var. Howellii (Greene) Cronq.) -- One of the 3 common species, the one which forms loose carpets with the leaves green and glabrous above. 2.0-4.5 dm high, the basal leaves 2.0-4.5 long and (0.8)-1.0-1.5 cm wide. Middle and upper stem leaves commonly ending in a scarious appendage. Spring. Dry Pine woods and mixed forests. --sY, S-BC, US -- var. athabascensis (Greene) Boivin -- Less than 2 dm high at flowering, but elongating to 3.5 dm at maturity. Rosette leaves narrower, mostly 2-3 cm long, but only 0.5-1.0-(1.2) cm wide. Middle and upper stem leaves ending in a scarious appendage. Prairies and Aspen bluffs. More or less transitional to the next species. --sMack, Man-BC -- Var. campestris (Rydb.) Boivin (A. campestris Rydb.; A. canadensis AA.; A. neglecta AA.; A. racemosa AA.) -- Smaller and the stem leaves with scarious or subulate tips. Less than 2 dm high. Rosette leaves shorter, only 1-2 cm long and 0.5-1.0 cm wide. Steppes and dry hills. --sMack, wO-BC, US.

In A. Howellii Greene f. concolor (Piper) stat. n., A. concolor Piper, Contr. US, Nat. Herb. 11: 604. 1906, the leaves remain somewhat tomentose above. We know of no specimen from our area and we suppose that an Alberta report by Moss 1957, queried by Boivin 1967, was merely a speculative entry.

A. Howellii Greene var. athabascensis (Greene) stat. n., A. athabascensis Greene, Ott. Nat. 19: 197. 1906.

A. Howellii Greene [May 19, 1897] var. campestris (Rydb.) stat. n., A. campestris Rydb., Bull. Torr. Bot. Club 24: 304. [June 29, 1897].

9. A. neodioica Greene var. neodioica (A. neglecta Greene var. attenuata (Fern.) Cronq.); A. obovata E. Nelson; A. oxyphylla Greene; A. petaloidea AA.) -- Like the last, but the leaf blades shorter, more abruptly contracted into a winged petiole, more permanently tomentose above. Long stoloniferous and forming loose carpets with

the new rosettes already full grown (but not fully spread out) at flowering time. Leaves up to 1.5 cm wide, but more commonly less than 1 cm. Winged petiole at least half as long as the blade. Involucrum 7-9 mm high. Late spring. Dry, open woods. --NF-SPM, NS-BC, US -- Var. Randii (Fern.) Boivin (A. canadensis Greene; A. neglecta Greene var. Randii (Fern.) Cronq.) -- Leaves glabrous above, even when young -- (NF, NS-PEI)-NB-Q-(nMan, neUS).
 Var. Randii (Fern.) stat. n., A. canadensis Greene var. Randii Fern., Proc. Bost. Soc. Nat. Hist. 28: 246. 1898.

Further west there is also a local variant, var. chlorantha (Greene) stat. n., A. chlorantha Greene, Ott. Nat. 18: 38. 1904, with a more deeply coloured involucre, the tegules being of a rather dark green towards the tip. Still known only from Chilliwack, B.C.

All Manitoba specimens (DAO) reported as A. petaloidea Fern. have since been revised to A. neodioica.

An Alberta report of A. petaloidea by Raup 1935 was based on a sheet from Pine Lake (CAN) since revised to A. Howellii.

An Alberta report of A. canadensis by Raup 1935 has not been investigated but is held to be improbable.

10. A. parvifolia Nutt. var. parvifolia (A. arida Nelson; A. microphylla Rydb.; A. nitida Greene; A. rosea Greene var. nitida (Greene) Breitung) -- Just before anthesis the stem is recurved downwards and the inflorescence is drooping, soon to become erect. Tegules tips often tinted in sulphur yellow. One of the 3 common species, the one with the smaller leaves and the denser carpet, the stolons being very short. Stems 1-3 dm high, the herbage whitish or grayish tomentose throughout, including the upper leaf surfaces, somewhat glandular in the inflorescence. Basal leaves (0.5)-0.8-1.0-(1.5) cm long, 6 mm wide or less, spatulate, the stem leaves 1.0-1.8 cm long. Involucre 5-7 mm high. Staminate plant similar, somewhat smaller and about as common as the pistillate plant. (Staminate plants are rare or unknown for most of our species.) Early summer. Common in prairies and steppes. --K-Aka, O-BC, US -- Var. bracteosa (Rydb.) Boivin -- Larger, 3.0-4.5 dm high, the stem leaves \pm 2 cm long and the involucre \pm 7 mm high. Rare, Cypress Hills. --swS-seAlta, (US).

On the application of the names A. aprica, A. microphylla, A. parvifolia and A. rosea, see Boivin 1951 and 1953.

11. A. rosea Greene var. rosea -- Conspicuous by its tegules variously tinted in light pink to cherry red. Stems 1-4 dm high, the inflorescence nodding before anthesis like the last. Basal leaves (0.8)-1.5-2.0-(2.5) cm long, including the ill-defined petiole, oblanceolate,

mostly 2-3 mm wide and nearly erect; stem leaves linear, \pm 2 mm wide. Otherwise similar to A. parvifolia. Early summer. Open woods and prairies. -- K-Aka, wcQ-nO-BC, US -- F. decipiens Boivin -- Tegules white. A rare local form not to be confused with the previous species. Note the narrower and more erect leaves of A. rosea. -- Alta-BC -- Var. imbricata (Nelson) Boivin -- Leaves larger, the basal ones obovate-spatulate, 4-6 mm wide; stem leaves oblong-lanceolate, 3-5 mm wide. Cypress Hills and Rockies. --swS-Alta, US.

12. A. corymbosa E. Nelson -- Rather similar to the last, but the tegules not tinted and the basal leaves narrower and more elongate, linear-oblongate and commonly 2.5-4.0 cm long. Early summer. Open montane forest. --swS-Alta, wUS.

Perhaps only a minor variant to be consolidated with A. rosea f. decipiens.

13. A. aprica Greene var. aprica (A. parvifolia sensu Cronq., etc.; A. parviflora sphalm.) -- The lowest of the 3 common species, short, with large heads, and leaves equally tomentose on both faces. Stem commonly \pm 1 dm. high, stiffly erect. Basal leaves (0.6)-1.0-(1.5) cm long, cuneate-oblongate. Involucre 7-10 mm high. Late spring. Common in prairies and steppes. --wO-BC, US, (CA) -- F. roseoides Boivin (A. parviflora Nutt. f. roseoides (Boivin) Breitung) -- Tegules pinkish at tip. -- S-BC, US -- F. brunnea Boivin (A. parvifolia Nutt. f. brunnea (Boivin) Breitung) -- Tegules strawbrown at tip. Boisé Coteau. -- swS -- Var. minuscula Boivin -- Smaller, only 1-3 cm high, and the involucre only 5.5-7.0 mm high. Rare: Touchwood Hills. --sS.

Var. minuscula (Boivin) stat. n., A. minuscula Boivin, Nat. Can. 80: 122-123. 1953.

14. A. isolepis Greene -- Differentiated from the last 4 by the scarious appendages of its middle and upper stem leaves. Said appendages largest and most noticeable of all our species. Stem 1-2 dm high; herbage grayish-tomentose. Basal leaves \pm 1 cm long, oblanceolate. Perhaps nodding before anthesis. Tegule tips transitional to the subsequent species: the outer squarrose and brownish, the inner white but somewhat finely speckled in brown. Mid summer. Dry, sandy or gravelly arctic tundra. -- K-Mack-(Y)-Aka, L. nQ, (nMan, nBC).

15. A. russellii Boivin (A. oxyphylla AA.) -- Tegule tips golden brown to straw-coloured. Otherwise similar to A. neodioica, the leaf blades obovate and abruptly narrowed to a winged petiole, the upper surface permanently tomentose. Heads slightly smaller, the involucre only 6-7 mm high. Early summer. Dry hills and open woods: Cypress Hills. --swS, wUS.

The name A. oxyphylla has been used in a rather wide variety of meanings. Greene's original description seems to correspond to a phase of A. neodioica in which the leaves are more heavily tomentose above. Russell 1954 and Breitung 1954 were dealing with A. Russellii. Porsild 1950 seems to refer to a minor segregate of A. rosea, at least as far as his northern-most specimens are concerned. And our own 1960 report for Cranbrook in British Columbia was based on specimens we now place in A. Howellii var. athabascensis. Raup's 1936 and 1947 reports have not been investigated.

Sp. n., A. oxyphylla sensu Russell 1954, sensu Breitung 1954. Superficialis et coloniam laxam evolvens. Caulis 2-3 dm alt. Stolones procumbentes, radicanes, 2-6 cm long., rosettam novam gaudentes aetate florendi. Folia inferne albo-tomentosa, superne griseo-tomentosa; rosularia 1.5-2.5 cm long., late radiantia, lamina obovata 5-10 mm lat., ad summas rotundata, mucronulata, ad basam in petiolum alatum angustata; caulinarum ad summas subulata, nec appendiculata nisi interdum superiora 1-2. Inflorescentia rotundata-corymbosa ex 5-6 capitulis. Involucrum 6-7 mm alt., tegulis ad summas brunneo-stramineis. Planta mascula mihi ignota. Type: A.J. Breitung 4414, Cypress Hills Park, open Pine and Aspen woods, July 7, 1947 (DAO).

16. A. umbrinella Rydb. (A. aizoides Greene) -- Heads rather small and the tegule tips brownish. About 1 dm high, the leaves equally grayish-tomentose on both faces. Stolons short, forming small dense carpets of rather short and broad leaves, mostly obovate. Lower stem leaves similar, but narrower. Involucrum 4-5 mm high. Late spring. Gravel slopes and shale slides in the mountains: Cypress Hills and Rockies. --swS-seBC, US.

17. A. dimorpha (Nutt.) T. & G. -- Scapose or nearly so and forming dense and exclusive patches. Perennial from a taproot. Basal leaves 1.5-2.5 cm high, oblanceolate, overtopping the single head. Tegule tips brownish. First half of spring. Eroded steppes, often pioneering. Rare. --swS-sAlta-BC, wUS.

18. A. alpina (L.) Gaertner var. alpina -- Tegule tips greenish to dirty green or dark green. Short stoloniferous and forming small and dense carpets. Stem (0.5)-1.0-(1.5) dm high. Herbage grayish tomentose, the rosette leaves discolour, very densely tomentose below, but glabrescent above, the older ones greenish and glabrous or nearly so on the upper surface. Middle and upper stem leaves conspicuously appendiculate. Involucre usually 5-6 mm high. Mid summer. Alpine meadows and summits, rare. -- G-(F-K, L), nQ, swAlta, Eur -- Var.

canescens Lange (var. media (Greene) Jepson; A. canescens (Lange) Malte; A. media Greene; A. mucronata E. Nelson; A. subcanescens Ost.) -- Leaves permanently whitish tomentose on both faces. Tegules tips brown to greenish, as in var. alpina. Much more common. -- G-(F)-K-Mack-(Y)-Aka, L, Q, swAlta-BC, wUS.

19. A. monocephala DC. var. monocephala -- Tegules tips also greenish and otherwise much as in A. alpina, but typically monocephalous, sometimes with a second and smaller head. Stolons short, tending to form small tufts, or the plants sometimes solitary. Rosette leaves green and glabrous or nearly so above. Tegules strongly squarrose and very dark green. Leaves whitish-lanate below, glabrous or nearly so above. Early summer. High alpine. -- wMack-Aka, swAlta-eBC.

In the Alaskan var. exilis (Greene) Hultén the tufts are laxer, the stolons being up to 5 cm long, and the leaves are white tomentose on both faces, with a more elongate petiole.

20. A. angustata Greene -- Tegule tips greenish like the last two, but the heads larger and the narrower leaves longer. Not stoloniferous, but tufted, the new shoots being short and ascending. Leaves linear-oblongate, tomentose, commonly glabrescent above. Heads usually solitary. Involucrum 8-10 mm high, lightly to heavily lanate towards the base. Early summer. Alpine slopes. --(G)-F-Mack-(Y-Aka), L, nQ, swAlta-(eBC).

21. A. glabrata (J. Vahl) Greene -- Similar to the last, of which it is perhaps only a rare phenotype. Herbage, and especially the rosette, much less pubescent, green and glabrous to merely lightly tomentose. (Early summer?). Wettish alpine slopes. -- G-(F-K)-Mack, swAlta.

18. ANAPHALIS DC.

EVERLASTING

White-woolly and the tegules petaloid like the last and the next, but the flowers unisexual; the pistillate and staminate present together in each head.

1. A. margaritacea (L.) B. & H. (var. subalpina Gray) -- Straw-Flower, White Daisy (Mortelle, Immortelle) -- Like a large Antennaria without basal leaves but with long and numerous stem leaves. Stoloniferous, 3-8 dm high, virgate. Leaves 5-15 cm long, linear-lanceolate, green and often floccose above, revolute. Heads numerous and showy in a corymbiform inflorescence. Tegules milky-white, strongly contrasting with the darker center. Mid summer. Light soils in semi-open Coniferous forests. --wMack, Aka, L-SPM, NS-BC, US, Eur.

Quite local across our area: southeastern Manitoba, Cypress Hills and Rocky Mountains. We were unable to substantiate a report from Cutknife, Sask., by Fraser 1944, Russell 1954, and Breitung 1957.

Many varieties have been proposed, based mainly on size of plant, number, size and width of leaves, and density of pubescence. We are not yet convinced that these characters are sufficiently correlated inter se and with a well defined and individualized distribution to justify taxonomic recognition. Some of the variation could be ecologically conditioned.

19. GNAPHALIUM L.

CUDWEED

Lanate and with petaloid tegules like the last two. Not dioecious. All flowers either perfect or pistillate and both types present in each head. Our species all annual.

- a. Stem simple below the terminal corymb or panicle.
 - b. Stem glandular-viscid 3. G. viscosum
 - bb. White-tomentose, not glandular.....
 - 4. G. microcephalum
- aa. Stem much branched and leafy under the head clusters.
 - c. Tegules acutish and dirty green to brownish in the upper half 1. G. uliginosum
 - cc. Rather rounded at tip, the inner hyaline in the upper half 2. G. palustre

1. G. ULIGINOSUM L. -- Wartwort -- Branchy annual with numerous small terminal clusters much overtopped by the surrounding foliage leaves. 2 dm high or less. Tomentum on the stem thinner than the thickness of the stem itself. Leaves oblanceolate to long linear. Summer. Infrequent in exundated places. -- (G), Mack-(Y-Aka), L-SPM, NS-BC, US, Eur.

Specimens have been checked from Angusville, Rose-town Paradise Hill, Saskatoon, Medicine Hat and Fort Saskatchewan. Such sporadism almost surely denotes an introduced entity.

2. G. palustre Nutt. -- Similar, more woolly and the leaves broader. Tomentum looser, especially upwards, becoming thicker than the width of the stem and branches. Leaves ovate to oblanceolate, becoming shorter and broader in the inflorescence and not overtopping the heads so much. Mid summer. Marshy depressions. -- S-BC, US.

3. G. viscosum HBK. (G. Macounii Greene) -- (Poverty-Weed) -- Leaves oblinear, discolour, decurrent for 3-10 mm. Tufted biennial. Stem and upper leaf surfaces densely glandular-pubescent, lower leaf surfaces

and inflorescence white tomentose. Heads numerous in a dense and lightly coloured inflorescence. Tegules light yellow to nearly hyaline. Rare in forest openings: Carbondale. -- NS-O, swAlta-BC, US.

G. Macounii was reported by Budd 1957 and 1964 from southern Manitoba, but this may have been a lapsus calami as the only sheet found at SCS was the Carbondale specimen described above.

4. G. microcephalus Nutt. (var. thermale (Nelson) Cronq.) -- Tufted perennial with numerous, small, whitish heads. Stems 3-4 dm high, + decumbent at base. Stem leaves gradually shorter upwards and grading into the short ultimate bracts subtending the heads. Just after mid summer. Dry foothill gravels in Waterton. --swAlta-sBC, wUS.

Re G. obtusifolium L. reported from Manitoba by Gleason 1952, see comment under Buchloë dactyloides. A further report by Budd 1957, 1964 is presumably based on Gleason's as no corresponding specimen could be located at SCS in 1967.

20. ADENOCAULON Hooker

Involucral bracts few, only 4 or 5. Heads without ligules, without chaff and without pappus.

1. A. bicolor Hooker -- Pathfinder, Silver-Green -- Leaves large, deltoid-cordate and lanate below, rather suggesting those of Petasites vitifolius. Stem leafy. Petioles winged. Inflorescence a diffuse panicle, almost bractless. Achenes few and not enclosed by the very small and reflexed involucre. Mid summer. Moist montane woods in Waterton. --(0), swAlta-sBC, US.

21. IVA L.

MARSH-ELDER

Similar to the next two, but the involucre not becoming indurated nor spinescent at maturity. Heads small and discoid with a chaffy receptacle. Pappus lacking. Main leaves opposite, the upper alternate.

a. Heads solitary in the axils..... 1. I. axillaris
aa. Heads numerous in a panicle of racemes

..... 2. I. xanthiifolia

1. I. axillaris Pursh var. axillaris -- Poverty-Weed -- Heads solitary and drooping on recurved pedicels. Branchy herb with lanceolate to linear leaves, the main ones opposite, the upper alternate. Herbage inconspicuously glandular, not punctate. Leaves nearly glabrous on both faces, becoming pubescent towards the edges. Mid summer. Alkaline soils, sometimes aggressive in cultivated or disturbed ground. -- sMan-Alta, cUS -- Var. robusta

tior Hooker -- Herbage glandular-dotted in yellow or brown and abundantly pubescent. Leaves lanceolate to elliptic. Wood Mountain. -- scS, scBC, wUS.

2. I. xanthiifolia Nutt. (Cyclachaena xanthiifolia (Nutt.) Fres.) -- Coarse annual with large, ovate and irregularly serrate leaves. Herbage \pm scabrous, but the stem smooth below. Leaves paler beneath, the main ones opposite, the upper alternate. Late summer. Exundated shores of saline waters, invading disturbed soils and waste places. -- NS-BC, US, Eur.

Apparently native around sloughs from southwestern Saskatchewan westward to the Rockies, a casual adventive elsewhere.

22. AMBROSIA L.

RAGWEED

Heads unisexual, the staminate ones in long terminal racemes, the pistillate ones axillary and strongly modified, containing a single flower without corolla, the tegules fused together into a pod-like bur which is acicular in the upper part, and becomes semi-woody. Heads rayless and with filiform chaff on the receptacle. Pappus none.

- a. Leaves both trifid and serrate or merely serrate 1. A. trifida
- aa. Leaves pinnatifid to bipinnatifid.
 - b. Perennial; leaves opposite 3. A. psilostachya
 - bb. Annual; leaves all or mostly alternate.
 - c. Involucre of the staminate flowers entire 2. A. artemisiifolia
 - cc. Deeply lobed; stem acicular-hispid ..
..... 4. A. acanthicarpa

1. A. trifida L. var. trifida (f. integrifolia (Muhl.) Fern.) -- Great Ragweed, Buffalo-Weed (Grande herbe à poux) -- Main leaves large, opposite and trifid. Tall and coarse annual, usually little branched. Leaves sometimes ovate and merely serrate. Petiole winged. Corners of the achene prolonged into short points. Second half of summer. Riverward edge of galerie-forests and casually as a weed undisturbed places. -- NS-BC, US, Eur.

Seems native from southeastern Saskatchewan eastward to southwestern Quebec; an uncommon adventive elsewhere.

Leaf shape is rather variable. Stem leaves are typically trilobed to tripartite. Upper leaves, lower leaves, and leaves from depauperate individuals may be unlobed (= f. integrifolia). South of us there is another variant, var. texana Scheele, in which the petioles are

wingless and the achenes tuberculate rather than acicular on the angles.

2. A. artemisiifolia L. (var. elatior (L.) Des-courtils, f. villosa Fern. & Griseb.; A. elatior L.) -- Ragweed, Hogweed (Herbe à poux, Roupie) -- An annual inconspicuous except for the long terminal racemes of staminate heads. Leaves ± bipinnatipartite, narrowly decurrent on the petiole, the lobes mostly 2-3 mm wide, the pubescence short and nearly appressed. Stem pubescence very long, spreading hirsute. Fruit with a row of spreading spines near the top, these not very sharp. After mid summer. Common as a weed, but also native around desiccating sloughs west of the Missouri Coteau. -- NP, NS-BC, US (CA), SA, Eur.

3. A. psilostachya DC. var. coronopifolia (T. & G.) Farw. (A. coronopifolia T. & G.) -- Much like the last, but perennial by deeply buried rhizomes and the leaves not so deeply divided. Stem leaves all opposite, merely pinnatipartite, the lobes mostly around 5 mm wide, decurrent on the winged petiole. Stem pubescence like that of the leaves, only a little longer. Fruit sometimes spineless, but mostly with a crown of not very long and not very sharp projections. Mid to late summer. Occasional in somewhat alkaline prairies and shores. NS-PEI, Q-BC, (US, CA), Eur.

Apparently present in Alberta only as a railway weed at Craigmyle where it was collected by Brinkman in 1922 (ALTA). This collection is the justification of the report by Moss 1959. An earlier report by Groh 1944 was based on Macoun 949, Red Deer Lakes, July 21, 1879 (DAO). But the specimen belongs to A. artemisiifolia and the Red Deer Lakes (or Coteau Lakes) are in Saskatchewan, 10-15 miles southwest of Outlook.

The typical phase is Mexican and is reported to be more finely pubescent on the staminate involucrem.

4. A. acanthicarpa Hooker (Franseria acanthicarpa (Hooker) Cov.) -- Sandbur -- Fruit a bur with many and very sharp spines. Annual and mostly similar to A. artemisiifolia, but very rough pubescent, the stem almost acicular-pubescent. Bur usually with a terminal spine and two rings of lateral ones. Second half of summer. Pioneer on wind eroded sandhills; also adventive at Saskatoon. --swMan-sAlta, US.

23. XANTHIUM L.

CLOTBUR

Fruit a bur formed of fused tegules and covered with numerous acicules hooked at tip. Heads unisexual, the staminate ones few and not obvious. Pistillate ones reduced to 2 flowers, maturing into a bilocular woody bur.

- a. Ferociously armed with axillary spines.....
 1. X. spinosum
 aa. Not spiny except the burs 2. X. strumarium

1. X. SPINOSUM L. -- Cocklebur, Bathurst-Bur (Petite bardane) -- Very spiny herb with numerous, yellow, branched, very sharp and very long spines. Leaves lobed, whitish-tomentose below. Bur smaller than in the next. Late summer. Rare weed: Steelman. --O, S, BC, US, SA, Eur.

2. X. strumarium L. (var. canadense (Miller) T. & G., var. glabratum (DC.) Cronq.; X. canadense Miller; X. commune Britton; X. echinatum Murray; X. glanduliferum Greene; X. italicum Moretti) -- Cocklebur (Gratia, Glouteron) -- Fruit a bur about 2 cm long and covered with catchy acicules, the top two acicules stronger. Very scabrous annual. Leaves deltoid-ovate, irregularly serrate. Mid summer. Shores; weedy on occasion. --NS-BC, US, (CA, SA), Eur, (Oc).

This shore plant is at the origin of the name of the Rivière aux Gratiass. The latter is the French toponym of the lower half of the Boyne River, the upper half being the Rivière des Ilets de Bois.

24. HELIOPSIS Persoon

OX-EYE

Resembles Helianthus both habitally and technically, but the receptacle conical, hence the flower center is raised. Also the peripheral florets are fertile (sterile in Helianthus). Rays marcescent, like Zinnia to which it is related.

1. H. helianthoides (L.) Sweet var. scabra (Dunal) Fern. (ssp. occidentalis Fischer) -- Ox-Eye--Monocephalous and showy perennial, resembling Helianthus, but the ligules sulphur (rather than orange) yellow. Very scabrous virgate herb with ovate, opposite, serrate leaves. Peduncle elongate, thickened below the head. Tegules rounded at tip. Mid summer. Open woods and outer edge of galerie-forests. --PEI-ecS, (BC), US.

Our taxonomy differs from that of the latest monographic study by T.C. Fischer, in Ohio Journ. Sc. 58: 97-107, 1958, and is justified as follows.

The typical variety is common in the eastern half of the U.S.A., barely entering Canada in southern Ontario. Its leaves are thin, triangular-lanceolate, rounded or cuneate at base, glabrous on both faces, varying to lightly scabrous above and somewhat short pilose below.

The more northern and more widespread phase has thicker and coriaceous leaves, deltoid-ovate, truncate at base, scabrous on both faces, more strongly so above. We are calling it var. scabra because its short and sca-

brous leaves seem to fit Dunal's original description (foliis scabris, ovate oblongo ...) better than the next variety does.

In a yet undescribed variety ranging from Illinois to Texas the leaves are narrower but scabrous. It was called ssp. scabra by Fischer but this interpretation is questionable as pointed out above. This southwestern phase may then properly be known as var. Fischeri var. n. (= ssp. scabra sensu Fischer, nec Dunal), folis scabris, ab ovato-lanceolatis anguste lanceolatis, saepius ter longioribus quem latis. Type: D. Demaree 6648a, near Avoca, Arkansas, May 17, 1929 (DAO).

25. RUDBECKIA L.

CONE-FLOWER

This, the last and the next two genera are easily spotted by the very protuberant center of the head, because of a conical to cylindrical receptacle. Disk flowers, but not the ligulate flowers, subtended by bracts. Ray flowers sterile.

- a. Leaves pinnatifid to serrate 1. R. laciniata
 aa. Entire to shallowly serrate 2. R. hirta

1. R. laciniata L. var. laciniata -- Coneflower, Golden Glow -- Very tall herb with large heads, the disk ovoid and the ligules yellow. Often 1-2 m high. Nearly smooth except for the scabrous leaf margins. Leaves large, trifid to pinnatifid with serrate lobes, the upper leaves often not lobed but ovate and merely serrate. Heads few, corymbose on long peduncles. Second half of summer. Galerie-forests, often along the inner (or river) edge. --NS-sMan, US, Eur.

In our plant the leaves are glabrous above and ± strigose below, while the disk scales are only 3-4 mm long. It is seemingly native from southern Manitoba to southwestern Quebec. Its occurrence still further east is probably related to its cultivation as an ornamental. A variant from the central U.S., var. ample (Nelson) Cronq., has somewhat larger heads, its scales larger, ± 7 mm long, and its leaves glabrous below but usually strigose-muricate above.

2. R. hirta L. (R. serotina Nutt.) -- Brown-eyed Susan, Nigger-Heads (Marguerite jaune, Obéliscaire) -- Showy herb with bicolour heads, the ligules yellow, the semi-hemispheric center purple-black. Stem abundantly punctate in purple-brown, coarsely hirsute and 4-7 dm high, usually virgate and monocephalous. Leaves lanceolate and commonly entire. Tegules nearly as long as the ligules. Mid summer. Open places, mostly on chernozems. --NF, NS-BC, US.

Native with us, but only an introduction in B.C., mainly an introduction in Eastern Canada.

26. ECHINACEA Moench

Like the last but the receptacle bracts spinescent and overtopping the disk florets.

1. E. angustifolia DC. var. angustifolia -- Very showy and very conspicuous; rather similar to the more common Rudbeckia hirta in herbage and habit, but the longer and drooping ligules are pink, fading purple. Disk purple brown. Just before mid summer. Bluffs of coulees and sandy deltas, locally abundant. --swMan-seS, CUS.

Sometimes treated as a variety of the more southern E. pallida Nutt. but the material at hand shown no intermediates.

Our var. angustifolia is usually monocephalous and the stem leaves and peduncle are hirsute to hispid. More southern plants, especially those from Oklahoma, may bear a few heads and be more or less atrigose on the leaves and peduncles, these have been named var. strigosa McGregor.

27. RATIBIDA Raf.

Like Rudbeckia, but all florets subtended by bracts. This and the last are perhaps not generically distinct from Rudbeckia.

1. R. columnifera (Nutt.) Woot. & Standl. (Lepachys columnaris (Sims) T. & G.) -- Very showy composite with the center of the head cylindrical (!) and subtended by usually 4-(6) large, drooping, yellow ligules. Tufted perennial with pinnatifid alternate leaves. Terminal lobe largest, the lower ones successively smaller. Head with brownish to purple disk. Mid summer. Frequent weed along railroads, roads, etc., also apparently indigenous at least in southern Saskatchewan. --O-seBC, US (CA) -- F. pulcherrima (DC.) Fern. -- Ligules purple. --Man-Alta, US -- F. denudata Boivin -- Ligules lacking. Val-Marie and Bowmantown. --S-Alta.

F. denudata (Boivin) stat. n., R. columnaris Sims f. denudata Boivin, Nat. Can. 87: 46. 1960.

The area of native occurrence is not easy to define. Generally found along roadsides, railway embankments, etc. But in the extreme south of Saskatchewan it seems to recur in some places as a normal element of steppic vegetation. We hold no opinion about Manitoba and Alberta, but in Ontario it is certainly an introduction.

28. BALSAMORHIZA Nutt.

Related to Helianthus, with the peripheral florets fertile and the foliage mostly basal.

1. B. sagittata (Pursh) Nutt. -- Balsam-Root -- Forming rather conspicuous rosettes of large leaves similar to those of Petasites or Arctium. Stem monocephalous and with smaller and narrower leaves. Herbage soft tomentose, the tomentum especially dense near the head. Basal leaves with blades at least 1 dm long and triangular-sagittate; stem leaves few, † lanceolate. Head 6-8 cm wide. Late spring and early summer. Foothill prairies. --swAlta-BC, US.

Reports for Saskatchewan by Rydberg and later authors do not appear to be substantiated by any actual collection from the province.

29. HELIANTHUS L.

SUNFLOWER

A basic type with large heads radiate in yellow and pappus reduced to 2 caducous awn-scales. Receptacle chafy. Ligulate flowers sterile.

- a. Annual; leaves alternate.
 - b. Tegules 5 mm wide or more, long caudate ..
 - 1. H. annuus
 - bb. Narrower and barely caudate 2. H. Couplandii
- aa. Perennial; leaves all or mostly opposite.
 - c. Tegules strongly imbricate, broadly acute to rounded at tip3. H. subrhomboideus
 - cc. Outer tegules narrowly acute to acuminate and mostly about as long as the involucre.
 - d. Leaves ovate, rounded to a petiole 2-5 cm long 6. H. tuberosus
 - dd. Leaf blade oblong-ovate to linear; petiole 1 cm long or less.
 - e. Leaves conduplicate and falcate in the smaller plants; heads racemose in the larger plants
 - 4. H. Maximilianii
 - ee. Leaves flat and the heads corymbose; petioles long ciliate
 - 5. H. Nuttallii

1. H. ANNUUS L. cv. GIGANTEUS -- (var. macrocarpus (DC.) Cockerell) -- Sunflower (Soleil, Tourne-soleil) -- Typically with a single gigantic head nodding towards the sun. Disk 5 cm wide or over. Cultivated and casually reseeding itself, but labile. --NS-PEI, Q-Alta, US, (Eur) -- F. lenticularis (Douglas) Boivin (H. lenticularis Douglas; H. petiolaris Nutt.) -- Wild form of the above. Herbage very rough. Leaves serrate, ovate or deltoid-ovate, 3-10 cm wide. Disk 3-5 cm wide. Tegules 5-8 mm wide, 1.2-2.0 cm long, ovate and abruptly long caudate. Disk purple. Mainly in late summer. Rare

native along eroded coulées; mostly a common weed, especially of roadsides. --PEI-BC, US -- F. FALLAX Boivin -- Disk florets orange. Forget. --sS.

A Manitoba report of f. fallax by Boivin 1960 is to be discounted as it was based on a variant of cv. Giganteus in which the disk florets are orange instead of the usual deep purple.

F. lenticularis seems to be present as a native pioneer species along a few eroded river banks of southwestern Saskatchewan and extreme southern Alberta.

2. H. Couplandii Boivin (H. aridus AA.; H. petiolaris AA.) -- Habitally resembling the last but more delicate and somewhat shiny when alive. Very branchy or with suppressed shoots in all leaf axils. Leaves 0.5-3.0 cm wide, triangular-ovate to triangular-lanceolate, usually entire. Tegules 0.7-1.5 cm long, 3.0-4.5 mm wide, lanceolate, slightly acuminate. Ligules shorter, only 1.5-2.0 cm long. Mid summer. Showy on eroded sandhills; also on disturbed sands. --O-seBC, US.

Sp. n., H. aridus auctorum, nec Rydb.; H. petiolaris auct. nec Nutt. Annuus scaber, (2)-4-(7) dm alt., ramosissimus vel fasciculiferus in axillis foliorum praecipuis. Folia persaepeus integra, ab ovatis lanceolata, ad basas late cuneata vel rotundata, 2-5 cm long., 0.5-3.0 cm lat. Petiolus 1-4 cm. Capita saepius numerosa et paniculata, interdum unicum, centro atropurpureo. Tegulae ab ovato-lanceolatis lanceolatae, (0.7)-1.0-(1.5) cm long., 3.0-4.5 cm lat. Ligulae 1.5-2.2 cm. Type: B. Boivin 6682, entre Big Stick Lake et Crane Lake, espèce pionnière sur les dunes éventrées, 28 juillet 1949 (DAO). We have had an opportunity to examine the types of H. aridus Rydb. (NY) and of H. petiolaris Nutt. (K). Both belong to H. annuus f. lenticularis.

Dr. R.T. Coupland of the University of Saskatchewan is the author of many important papers on our area, including Ecology of Mixed Prairie, Ecol. Mon. 20: 271-315, 1950.

3. H. subrhomboides Rydb. (H. laetiflorus Pers. var. subrhomboides (Rydb.) Fern.) -- Main leaves rhomboid-ovate to rhomboid-lanceolate. Long stoloniferous, hardly tuberous. Heads on very long peduncles and solitary, or the peduncles incurved into a candelabriform inflorescence. Tegules ciliate, glabrous dorsally, the inner acutish, the outer often rounded, and less than half as long as the involucre. Mid summer. Dry, open places, usually on chernozems. --Y, NB-BC, US, Eur.

The related H. laetiflorus was reported for Saskatchewan by Fernald 1950, but we found no corresponding specimen at GH in 1965.

4. H. Maximiliani Schrader -- Smaller plants monocephalous, grayish, the leaves conduplicate and strongly falcate. Larger plants with the foliage not quite so characteristic but the inflorescence elongated, somewhat racemose and often secund. Roots tuberous in the manner of the next. Leaves alternate in the upper third, long attenuate at base, the middle, and upper ones sessile, or sometimes the middle ones tapered into a short, ill-defined and winged petiole. Leaf pubescence abundant on both faces, the hairs less than 0.5 mm long and nearly strigose; stem pubescence similar, but sometimes less dense; leaf base not conspicuously ciliate. Involucre 1-2 cm high. Ligules about 2 cm long. Second half of summer. Chernozems, especially around depressions. -- PEI, Q-BC, US.

Native on chernozems between Lake of the Woods and Regina, frequently introduced between Regina and Saskatoon, a sporadic introduction elsewhere; Swift Current, Redcliffe, Calgary, etc.

A dot map in Brittonia 18: 74, 1966 credits this species with a substantially more northern reach (north to Churchill River and James Bay), than the outline given just above. The discrepancy is apparently related to a difference in taxonomic treatment; what we are here calling H. Nuttallii var. subtuberosus being reassigned by Long partly to ssp. canadensis, partly to H. Maximiliani. Hence the similarity in northern limits for the maps on pages 74 and 76 of said paper.

4X. H. Alexidis Boivin -- Hybrid with the next and combining various characteristics of both, such as the inflorescence broad, but the involucre high and the leaves conduplicate. Thornhill and probably elsewhere also. -- sMan.

Hybr. n. Verosimiliter H. Maximiliani X Nuttallii. Variabilis et exhibens notas varias parentium, v.g.: inflorescentia lata, corymbosa atque folia late lanceolata, sed involucrum majus, 15-20 mm alt., folia conduplicata, ligulae \pm 2 cm long, etc. Type: J.F. Alex 121, Manitoba, Lisgar District, Thornhill, 1 mile south, native grassland along dry waterway adjacent to highway, Sept. 4, 1957 (DAO).

5. H. Nuttallii T. & G. var. Nuttallii -- Often closely resembling the last, but the leaves flat and the heads corymbose if more than one. Stolons mostly 5-10 cm long, tuberous at tip, producing rootlets which are tuberous towards their attachment. Leaves \pm 1 cm wide, linear to linear-lanceolate, opposite except perhaps the upper 1-3, cuneate at base, petiolate. Petioles successively shorter, the middle ones around 1 cm long, coarsely ciliate, the cilia over 1 mm long. Stem

lightly pubescent to nearly glabrous, the coarse hairs similar to the cilia, but somewhat shorter. Midnerve pubescent like the stem, but the hairs still shorter. Leaves heavily scabrous on both faces with very short hairs inflated at base. Heads monochrome. Tegules 1.5 cm long or less. Ligules 2-5 cm long. Second half of summer. Wettish prairies and along watercourses. --wO-BC, US -- Var. subtuberosus (Britton) Boivin (ssp. canadensis Long; H. fascicularis Greene; H. giganteus AA.; var. subtuberosus Britton; H. subtuberosus Britton) -- Leaves broader, \pm lanceolate, mostly 2-3 cm wide. Commoner. -- (Mack), NF, NS, NB-BC, US -- F. verticillatus Boivin -- Leaves verticillate in 3's or more. Local: Candle Lake. -- S, US -- Var. Rydbergii (Britton) Boivin -- Leaves broad and short, ovate to narrowly oblong., less than 1 dm long. The common phase along creeks in the steppe regions. --sMan-sAlta, US.

Var. subtuberosus (Britton) stat. n., H. giganteus L. var. subtuberosus Britton ex Britt. & Brown, Ill. Fl. 3: 425. 1898.

F. verticillatus nom. n., H. giganteus L. var. subtuberosus Britton f. verticillatus Lakela, nom. ill., Rhodora 49: 21. 1947, nec H. giganteus L. var. verticillatus Farwell 1927.

Var. Rydbergii (Britton) stat. n., H. Rydbergii Britton, Man. Fl. N. Stat. & Can. 993-994, 1901.

The trio H. Nuttallii, subtuberosus and Rydbergii constitute a series of strongly overlapping and completely intergradient phases; their recognition is undoubtedly mechanical. Yet each taxon presents a certain ecological specialization and some degree of geographical individuality; we have felt justified to retain them at the varietal level.

We are not happy yet about the degree and quality of distinctiveness of var. subtuberosus from the eastern H. giganteus L. However we are for the present retaining them as specifically distinct as per the more common current practice. The accepted criteria are as follows. Var. subtuberosus: leaves all opposite, or the upper 1-(3) alternate; tegules ciliate with hairs under 1 mm long and only half as long as the petiolar cilia; leaf pubescence similarly dense and short on both faces, although the hairs are more strongly bulbous-based on the upper face. H. giganteus: the upper (3)-5-(7) leaves alternate; tegular and petiolar cilia similar in size and over 1 mm long; leaf pubescence of dense, short, very stiff and strongly bulbous-based hairs on the upper face, but on the lower face the hairs are not bulbous-based, much less dense, and obviously longer, commonly 0.5-1.0 mm long. Unfortunately these criteria seem far from constant and discrete; it

might be preferable to subordinate H. Nuttallii and its varieties to the earlier H. giganteus.

If the latter solution proves to be preferable, the correct names of our three varieties would be as follows. The common and widespread phase with leaves of middling width returns to H. giganteus var. subtuberosus Britton. The narrow-leaved phase of steppic regions becomes H. giganteus var. utahensis D.C. Eaton. The broad-leaved phase of the steppic regions would require a new transfer.

6. H. tuberosus L. var. subcanescens Gray -- (Esquebois) -- Leaves largest, 5-10 cm wide, ovate, conspicuously 3-nerved, serrate, acuminate, rounded to a winged petiole, opposite. Very stoloniferous, the stolons very long and ending in a purplish potato. Mostly 1-2 m high. Leaves somewhat velvety below, the herbage otherwise scabrous. Heads few in a corymbose inflorescence. Late summer. Galerie-forests. --O-seS, (US).

In the more eastern typical phase the stem leaves are mostly alternate and scabrous on both faces.

Reports of H. divaricatus L. from Saskatchewan have yet to be tied down to specimens actually collected within our area.

30. COREOPSIS L.

TICKSEED

Intermediate to Bidens, the pappus being of two minute teeth. Tegules dimegueth and in two rings; the inner adnate at base and petaloid at tip, the outer much smaller and free. Disk not chaffy.

1. C. tinctoria Nutt. (C. Atkinsoniana Douglas) -- Eye-Flower, Tickseed -- Leaves opposite and pectinatipartite to bipectinatipartite. Biennial with rather scanty foliage, branchy and the branches opposite. Heads many, bicolour, the disk purple-brown, the ligules golden yellow with a purple brown patch near the base, cuneate with a ragged tip. Mid summer. Exundated places in drier parts of southwestern Saskatchewan and southern Alberta, elsewhere a casual escape from cultivation. --swQ-BC, US.

Appears to be native in southern Alberta and in southwest Saskatchewan, casually adventive or escaped from cultivation elsewhere.

C. Atkinsoniana is merely a form with narrowly winged seeds, sporadic in the range of the species, of no particular significance, not forming a distinct population.

Coreopsis lancolata L. and C. verticillata L. were reported by Macoun 1884 for Western Canada but this may have been a lapsus calami for Canada West. The latter was an alternate name for Upper Canada, now the southern part

of the province of Ontario.

31. THELESPERMA Less.

Obviously similar to the last but the disk chaffy. Pappus also of 2 reduced bristles. Inner involucrel bracts adnate for at least one third of their length.

1. T. marginatum Rydb. -- Heads discoid, its involucre campanulate, of fused bracts, its lobes broadly margined in white. Perennial herb with narrowly dissected leaves and 1 or more heads on very long and subnaked peduncles. (Mid summer?). Eroded hills, rare: Medicine Hat. --seAlta, ncUS.

We know of no Canadian collections other than the ones from The Hat and there is none other at the New York Botanical Garden. The various reports for Saskatchewan must therefore be the result of Medicine Hat being assigned to the wrong province.

32. BIDENS L.

Achenes catchy by 2 or 4 barbellate terminal acicules termed "horns" or "teeth". Tegules in two rings and dimorphic, the inner † petaloid.

- a. Submerged aquatic with leaves divided into filiform segments 4. B. Beckii
- aa. Terrestrial and the leaves with a well defined flat limb.
 - b. Head radiate; achene with 4 horns .. 1. B. cernua
 - bb. Eradiate; achene with only 2 horns.
 - c. Leaves compound..... 3. B. frondosa
 - cc. Simple, merely serrate to trifid ..
..... 2. B. tripartita

1. B. cernua L. (B. glaucescens Greene) -- Stick-tight, Pitchfork (Fourchettes) -- Heads radiate in yellow; however the ligule-like appendages are not derived from the outer florets, but from the inner petaloid tegules of the involucre. Leaves † lanceolate, sessile, serrate. Achenes with 4 horns. Mid to late summer. Common in wet places and shores. -- sMack, Aka, NS-BC, US, Eur.

1X. B. amplissima Greene (B. Stevensonis Boivin, nomen) -- Hybrid with B. frondosa var. puberula. Luxuriant annual with irregularly lobed to trifid or pinnatifid leaves. Rachis and petiole broadly winged. Heads irregularly radiate. Rare: Brandon. --sMan, swBC.

2. B. TRIPARTITA L. var. TRIPARTITA (B. comosa (Gray) Wieg.; B. connata Muhl.) -- Beggar-Ticks, Stick-tight (Fourchettes, Cornes) -- Leaves typically petiolate and trilobed, but very variable and ranging from

merely serrate to trifid, the upper leaves sometimes merely attenuate to a sessile base. Leaves and outer tegules scarious at margin, the latter sometimes scabrous, the herbage otherwise glabrous. Other characters pretty much as in the next species. Late summer. A rare adventive of wet places: Ronalane. -- NF, NS-O, seAlta-(BC), US, Eur.

Other reports from our area are probably to be discounted. The Manitoba records were discounted by Scoggan 1957. Reports of B. connata Muhl. from the Saskatchewan are based on a Drummond collection from Cumberland House. Its specimen basis has not been investigated yet, but since it has never been confirmed, it is expected to be based on B. frondosa var. puberula.

In our typical variety the achenes are over 2 mm wide, as contrasted with a sinolaurentian var. heterodoxa Fern. in which the disk achenes are only 1-2 mm wide.

3. B. frondosa L. var. frondosa -- Beggar-Ticks, Boot-Jacks (Fourchettes) -- Main leaves compound, mostly trifoliate, the petiole not winged. Glabrous to hirsute. Bracts of the outer series mostly 5-8, green and foliaceous, longer than both the inner series and the disk. Achenes with 2 horns, 2.5-5.0 mm long. Mid to late summer. Shores. -- NF, NS-Man, US, BC, Eur -- Var. puberula Wieg. (B. vulgata Greene, var. puberula (Wieg.) Greene) -- Coarser and the heads with 10-15-(20) tegules in the outer and longer series. Central achenes with horns 4-8 mm long. -- NS, (NB)-Q-BC, US.

A doubtful Alberta report of B. frondosa by Scoggan 1957 could not be substantiated and is herewith discounted.

4. B. Beckii Torrey (Megalodonta Beckii (Torrey) Greene) -- Water-Marigold -- Submerged and usually sterile herb with opposite leaves dissected into filiform segments. Emerged leaves, when present, entire to pinnatifid. Head solitary, radiate. Achene with 3-6 horns longer than the body of the fruit. Late summer. Quiet waters, rare: Wildnest River and Cumberland Lake eastward. -- NS, NB-ecS, sBC, US.

33. GALINSOGA R. & P.

Leaves opposite, the heads radiate, the pappus chaf-fy.

- a. Villous with hairs 0.5-1.0 mm long.... 1. G. ciliata
 aa. Glabrous or finely pubescent, the hairs
 † strigose 2. G. parviflora

1. G. CILIATA (Raf.) Blake -- Quickweed -- A. city weed with small heads briefly radiate in white. Villous annual. Leaves ovate, serrate. Heads about 5 mm high.

All seeds bear a pappus of scales about as long as the body of the seed. Late summer and fall. Neglected lawns and back lanes, rare. --NS-Man, Alta-BC, US, (CA, SA), Eur. (Afr, Oc).

We have checked only two collections from our area, Winnipeg and Calgary, both at DAO. The Boissevain report was based on a sheet of Potentilla norvegica. The Grand Beach and Edwin report have not been checked.

The inclusion of Saskatchewan in its range by Frankton 1970 was apparently based on a specimen cultivated at Saskatoon (DAO), the inference being that the initial seed supply originated somewhere within the province.

2. G. PARVIFLORA Cav. -- Joey Hooker, Yellow Weed -- Sufficiently similar to the first to be generally confused with it. Leaves entire or weakly crenate. Peripheral seeds without pappus. A rare town weed: Hamiota. --Q-Man, US, (CA, SA), Eur.

A rare weed in Canada; we have checked only three Canadian collections: Sherbrooke, Bridgeport and Hamiota, all DAO.

34. MADIA Molina

TARWEED

Most of the tegules half-wrapped around the outer achenes. Pappus none or much reduced.

1. M. glomerata Hooker -- Tarweed -- Heads narrow and few-flowered, about half as wide as high. Heavily glandular-pubescent annual, usually virgate. Heads not very conspicuous, about 1 cm high, few, discoid or briefly radiate in yellow, drying pink, the rays only 1-3, the disk flowers also very few. Second half of summer. Arroyos, sometimes weedy. --(Y-Aka), Q-BC, US.

Appears to be native from Saskatchewan westward, but also occurring as an uncommon adventive. Known in Manitoba from Souris (WIN) and Portage (SASK).

There has been a fair amount of confusion of this species with M. sativa; all specimens named M. sativa from eastern Canada that we have studied turned out to be M. glomerata.

35. HYMENOPAPPUS L'Hér.

Pappus of small hyaline scales. Heads discoid. Tegules in one series, scarious margined, not imbricate. Receptacle not chaffy.

1. H. filifolius Hooker var. polycephalus (Osterhout) B.L. Turner -- Leaves \pm bipectinatipartite. Tufted perennial from a taproot, (1)-2-(4) dm high, more or less white tomentose, especially the petioles, the base of the stem and the margin of the tegules. Leaf segments \pm 0.5 mm wide, finely pitted and punctate in deep green. Head

yellow. Early summer. Local on badlands. -- swS-sAlta, ncUS.

A highly variable species. In the latest monograph it is subdivided into a very complex series of 13 intergrading varieties. Only var. polycephalus is recorded as entering Canada. It is a fairly tomentose variant, of medium height, average leafiness and smallish flowers.

36. BAHIA Lag.

Not unlike the last, with a pappus of short hyaline scales. But the leaves opposite and the heads radiate. Not chaffy. Tegules in only one series.

1. B. OPPOSITIFOLIA (Nutt.) DC. (Picradeniopsis oppositifolia (Nutt.) Rydb.) -- A Composite with opposite and narrowly dissected leaves. Deeply stoloniferous perennial, 1-2 dm high. Densely puberulent, finely pitted and glandular-punctate. Heads few, yellow, radiate, but the ligules only 1-3 mm long and paler to nearly white. First half of summer. Eroded and saline clays along arroyos and ditches, rare. --swS-swAlta, US.

We have seen specimens from Nashlyn (DAO), Divide (DAO), Pambrun (CAN, DAO) and Coaldale (CAN, DAO). It has also been reported from Lethbridge.

37. HYMENOXIS Cass.

RUBBER-WEED

Like the last two with a pappus of short hyaline scales. Leaves alternate or basal. Heads radiate. Tegules more numerous, two layers thick, but isomegueth.

a. Leaves entire, all basal..... 1. H. acaulis
aa. Stem with deeply dissected leaves

..... 2. H. Richardsonii

1. H. acaulis (Pursh) Parker var. acaulis (Tetranuris simplex Nelson) -- Leaves densely soft sericeous on both sides, entire, oblanceolate, all basal. Forming a small dense cushion from a taproot. Scape about 1 dm high, monocephalous. Head yellow, radiate, the ligules fading white. Leaves finely glandular-punctate as in the last two genera. Early summer. Upper part of eroded hills; Mortlach and Cypress Hills westward. --swS-sAlta, US.

In the magnilacustrine var. glabra (Gray) Parker, the leaves are green, lightly villous or glabrescent, the heads often somewhat larger.

2. H. Richardsonii (Hooker) Cock. var. Richardsonii -- Leaves pectinately divided into 3-5 remote and filiform segments. Herbage green. In small tufts, about 1 dm high. Also glandular-punctate. Ligules yellow, fading white. Early summer. Wind eroded hills and bad-

lands. --sS-sAlta, US.

In a more southern var. floribunda (Gray) Parker the somewhat smaller heads are more numerous and the whole plant tends to be larger.

Macoun 1884 mentions a collection of Chaenactis Douglasii (Hooker) H. & A. by Dawson at Wood Mountain, but we have found nothing at CAN or MTMG under that name or under the neighbouring genera. Unless this be a lapsus calami for Actinella Richardsonii (Hooker) Nutt. (=Hymenoxys), the latter being represented at CAN by an old Wood Mountain collection which Macoun does not mention under the last two names.

38. HELENIUM L.

SNEEZEWEED

A basic type, similar to Helianthus, the heads radiate in yellow, but pappus present, of two or more series of hyaline scales. Receptacle not chaffy.

1. H. autumnale L. var. montanum (Nutt.) Fern. -- Sneezeweed -- Leaf blade decurrent down to the next node, the stem thus narrowly winged. Leaves lanceolate, usually entire, finely glandular-punctate in yellowish to pale brown. Heads yellow, more than hemispheric, with paler and drooping ligules. The latter (0.8)-1.0-(1.5) cm long, obtriangular, 3-lobed at apex. Mid to late summer. Wet-tish meadows and edge of woods. --wO-BC, (US) -- Var. grandiflorum (Nutt.) T. & G. (H. macranthum Rydb.) -- Heads larger, the ligules 1.5-2.5 cm long. --sMack, swAlta-sBC.

The collections from Saskatchewan distributed by Breitung as H. macranthum and reported by him as H. autumnale have been revised to var. montanum.

39. GAILLARDIA Foug.

Receptacle chaffy. Otherwise similar to Helenium. Ligules also conspicuously 3-lobed at apex. Receptacle convex to subglobose.

1. G. aristata Pursh -- Very showy bicolor head with a purple center and orange-yellow ligules purple at base. Short-lived perennial, hirsute, commonly monocephalous. Leaves entire to pinnatifid. Peduncle elongate. Head 4-8 cm across, the disk hemispheric. Tegules elongate and very unequal. Early summer. Occasional in prairies. -- sMack, swQ-BC, US-- F. monochroma Boivin -- Ligules and disk florests of a single colour, yellow throughout. Local: Waldheim, Milk River, Porcupine Hills. -- S-BC.

Specimens with smaller heads are found throughout, but the range of size variation increases gradually westward and the largest heads are found in the Rockies. This

was noted by Macoun long ago, but it seems difficult to define this situation in taxonomic terms, although it is not much unlike the situation in Helenium.

40. ANTHEMIS L.

CHAMOMILE

This and the next 5 genera similar to Helianthus, Helenium, etc., but the tegules scarious or hyaline along the margin. Receptacle conical, chaffy. Pappus none or vestigial.

- a. Heads radiate in white 1. A. Cotula
 aa. In yellow 2. A. tinctoria

1. A. COTULA L. -- Mayweed, Dogfennel (Petite Marguerite, Maroute) -- Peduncle pubescent. Tegules acutish at tip. Receptacle chaffy in the central half. Otherwise very similar to, and not readily distinguished from, the more common Matricaria Chamomilla. Summer. Rare railway weed: Morris, Killarney, Wetaskiwin, Troy. -- (Y-Aka, NF), NS-(PEI)-NB-Man-(S)-Alta-BC, (US, Eur.).

We have checked specimens from Morris (DAO) and Wetaskiwin (SASK) while Dr. C. Frankton has also checked specimens from Killarney (CAN) and Troy (CAN). Otherwise all reports from our area are held as questionable because of the frequent confusion with Matricaria. Manitoba and Saskatchewan reports by Groh 1948 were based on specimens of Matricaria Chamomilla, and for Alberta on M. maritima.

2. A. TINCTORIA L. (Cota tinctoria (L.) Gay) -- Yellow Chamomile (Oeil de boeuf, Camomille jaune) -- Heads ligulate and resembling a Daisy, but bright yellow. Leaves pinnatifid, the segments dimegueth, the larger ones entire segments. Summer. Infrequent escape, mainly along roadsides. -- Aka, NF, NS, NB-BC, US, Eur.

41. ACHILLEA L.

YARROW

Like the last, but the receptacle flattish and the heads quite small.

- a. Leaves serrate 1. A. Ptarmica
 aa. Much more deeply dissected.
 b. Leaves pinnatifid, the lobes dentate ...
 2. A. sibirica
 bb. Much more deeply and finely dissected ..
 3. A. Millefolium

1. A. PTARMICA L. f. MULTIPLEX (Reynier) Heimerl -- Sneezeweed, White Tansy (Herbe à éternuer) -- Double-flowered heads small and white in a corymb. Stoloniferous. More or less virgate, 3-10 dm high. Leaves li-

near-lanceolate. Summer. Cultivated and sometimes spreading to roadsides and waste areas. -- Aka, NS, Q-Man, Alta-BC.

2. A. sibirica Led. (A. multiflora Hooker) -- With small heads and obviously resembling the more common A. Millefolium, but taller and the leaves less divided. Virgate and tufted, 10-15 dm high. Leaves elongate, pinnatifid, the lobes oblong and serrate. Mid summer. Moist spots in forested regions, not frequent. -- Mack-Aka, Q-nBC, cnUS, (Eur).

3. A. MILLEFOLIUM L. f. PURPUREA (Gouan) Schinz & Thellung -- Yarrow, Fern-Tansy (Herbe à dindes) -- Ligules velvet-purplish above, pink below. Stamens lacking, hence sterile and spreading only be rhizomes. Otherwise similar to the common var. occidentalis, but somewhat taller and less densely pubescent. Late summer. Sometimes cultivated and rarely escaping to railway embankments, etc. --Aka, NS-Man, US, (Eur) -- Var. occidentalis DC. (var. lanulosa (Nutt.) Piper; A. lanulosa Nutt.) -- An almost ubiquitous herb with very finely dissected leaves and a corymb of small, white heads. Long stoloniferous. Leaves bipinnatifid to tripinnatifid into numerous small segments less than 1 mm wide. Involucre usually 4-5 mm high. Tegules pale brown to hyaline at margin. Ligules 1-4 mm long, white. Summer. Very common in open places, mainly steppes and prairies, sometimes weedy. --Mack, Aka, L-SPM, NS-(PEI)-NB-BC, US, (CA) -- F. rosea Rand & Redfield (f. roseoides Breitung) -- Ligules pink above, nearly white below. Local -- (NF-SPM), NB-BC, (US) -- Var. megacephala (Raup) Boivin (A. megacephala Raup) -- Heads larger, the involucre mostly 6-7 mm high. Mostly sand dunes. -- sMack, nwS-Alta -- Var. nigrescens E. Meyer (var. alpicola (Rydb.) Garrett, var. borealis (Bongard) Farw.; A. borealis Bongard) -- Tegules with a darker margin, brown to blackish. The more common or even exclusive phase northward. -- G, K-Aka, L-SPM, NS-BC, US, Eur-- F. roseiflora Boivin -- Tegules darker as in var. nigrescens and the ligules pink as in f. rosea. -- K-Aka, L-NF, Q-O,S-BC.

The first described is an uncommonly escaped ornamental. All specimens examined lacked anthers. That they are of European origin seems hardly questionable. The rest of the north American material is apparently native.

If we except the highly local and larger-headed var. megacephala, our specimens are fairly readily referable to the two varieties above. We have not however been able to detect a clear morphological gap between our American types and the legion of minor Eurasian variants. We have been equally unable to relate our plants clearly to the

many eurasian variants. Hence we could not be sure that the varietal epithets used are actually the earliest available.

The european plants are hexaploid and seem closest cytologically to var. nigrescens. But by their morphology it is var. occidentalis and var. Millefolium that are nearest to one another and hence often confused. This is also part of the uncertain nomenclatural situation.

Of our two main types, var. occidentalis is commonly tetraploid while var. nigrescens is hexaploid ($2n=54$). The level of morphological differentiation is low and its quality is poor. However it is possible to state that, grosso modo, the tetraploid var. occidentalis is the common and wide-spread type in North America, while in the mountains, on the Pacific slope and in subarctic habitats it generally gives way to the hexaploid var. nigrescens.

Our two varieties are further recognizable with the help of a good microscope as there is a slight average difference in the outer diameter of the pollen grains, a difference apparently related to the chromosome numbers. The following figures were obtained by Mulligan and Bassett in 1950:

var. occidentalis: $2n=36$; diam (26)-27-30-(31) μ .

var. nigrescens: $2n=54$; diam (31)-32-33-(34) μ .

Specimens of var. occidentalis from the interior of the continent are usually readily distinguished from var. Millefolium, but eastward the morphological distinction becomes gradually less convincing. Further, some of the eastern specimens with the apparent morphology of var. occidentalis have the pollen size of var. borealis. The opinion has been expressed that these could represent a european introduction, but the evidence in favor of the latter is rather negative and we are more inclined to treat this material as an intergrading series between our two main phenotypes. A similar situation prevails in the western U.S.A. where one meets with an hexaploid, var. californica (Pollard) Jepson, which approaches var. occidentalis in its morphology. In short, the correlation morphology-cytology is incomplete.

The tetraploid seems absent from Europe; obviously var. occidentalis should be regarded as native. Since var. nigrescens is primarily a plant of native habitats, it too is expected to be a native variant, even if also found in northern Scandinavia.

Our 1951 classification was rather elaborate and has not proved to be a good and practical scheme.

42. MATRICARIA L. WILD CHAMOMILE

Quite similar to Anthemis, yet the conical receptacle not chaffy.

a. Heads discoid..... 3. M. matricarioides
aa. Ligulate.

b. Receptacle hemispheric, somewhat broader
than high, sometimes becoming conical in fruit;
herb odorless 1. M. maritima

bb. Receptacle conical and much higher than
wide; herb pineapple-scented ... 2. M. Chamomilla

1. M. MARITIMA L. var. MARITIMA (var. agrestis (Knaf) Weiss; M. inodora L.; Chamomilla inodora (L.) Gilib.) -- Bachelor's Button, Barnyard-Daisy -- Much like the next species and not readily distinguished from it. Odorless. Corolla lobes yellow with a brown spot towards the tip. Achene with 3 very strong ribs and 2 large brown glands near the top on the outer face. Annual or biennial, 3-10 dm high. Tegules light-coloured along the margin, hyaline to pale brown. Mid to late summer. Casual weed, mostly of roadsides and railways. -- G, Mack, Aka, L-SPM, NS-BC, US, Eur -- Var. nana (Hooker) Boivin (M. ambigua (Led.) Krylov) -- Tegules dark-margined in brown to blackish. Often perennial and usually shorter, 1-4 dm high. Sandy arctic coasts. -- G-Aka, L, nQ-nO-nMan, (nEur).

Var. nana (Hooker) stat. n., Pyrethrum inodorum (L.) Sm. var. nanum Hooker, Fl. Bor. Am. 1: 320. 1834.

2. M. CHAMOMILLA L. (Chamomilla Chamomilla (L.) Rydb.) -- Wild Chamomile (Chamomille) -- Large-Headed and suggesting a Daisy by its bicolour heads, but the leaves bi- to tripectinatifid into numerous segments less than 1 mm wide. Ligules white, marcescent and eventually drooping. Disk yellow, hemispheric, tending to conical in fruit. Achene without glands. Closely resembling both M. maritima and Anthemis Cotula. From M. maritima it differs by being pineapple-scented when freshly crushed; corolla lobes pure yellow; achene rugose with 5-7 nerves; pappus reduced to a short crown-like ridge. From Anthemis Cotula it differs by its herbage glabrous or nearly so; tegules rounded at tip; receptacle not chaffy. Early summer. Infrequent weed of farmyards and roadsides. -- G, NF, NS, NB-(Q)-O-BC, US, Eur, (Oc).

3. M. MATRICARIOIDES (Less.) Porter (M. suaveolens (Pursh) Buch.; Chamomilla suaveolens (Pursh) Rydb.) -- Pineapple-Weed, Wild Marigold (Herbe à crapaud) -- Discoid and strongly pineapple-scented when freshly crushed. Annual, up to 5 dm high. Leaves finely dissected like the last two. Tegules broader, \pm oblong and more strongly cucullate at tip. Early summer to frost. Disturbed or bare soils, a common weed, very tolerant of tramping. --(G)-seF, Mack-Aka, L-SPM, NS-BC, US, (CA), Eur.

Reputedly native in the western U.S.A., it has always seemed to us introduced wherever we met with it in

Canada. In 1884 Macoun knew it only from the Pacific coast and from the upper Kootenay. This gives an idea of its path of entry or, conversely, of its original area as a native plant, assuming that it ever was native in Canada.

The range is extended to Franklin District on the basis of the following collection: A. Dutilly, Terre de Baffin, Cap Dorset, 25 août 1936 (QPA).

43. CHRYSANTHEMUM L.

OXYE-DAISY

Like Anthemis and Matricaria, but the receptable flattish and not chaffy. Head typically ligulate.

a. Heads discoid 3. C. Balsamita
aa. Ligulate.

b. Leaves long cuneate, grading into the petiole 2. C. arcticum

bb. Leaves dimorphic, the lower and basal petiolate, the middle sessile and not narrowed at base 1. C. Leucanthemum

1. C. LEUCANTHEMUM L. var. LEUCANTHEMUM (var. pinatifidum Lec. & Lam.; Leucanthemum vulgare Lam.) -- Daisy, Bull's Eye (Marguerite, Marguerite blanche) -- The typical Daisy, a loosely tufted herb with virgate monocephalous stems, the head with a yellow centre and long white ligules. Stems 3-8 dm high. Leaves lyrate-pinnatifid, more deeply so towards the base. Head 3-5 cm across. Mainly the first half of summer and then sporadically till fall. Formerly cultivated and now frequently spreading to wetter spots in pastures and along roadsides. --(NS-NB)-Q-(O)-Man-Alta-(BC, US, Eur) -- Var. BOECHERI Boivin (C. irtutianum Turcz.) -- Not so deeply dissected, the stem leaves merely serrate or may be some of them subpinnatifid towards the base. Similar habitats, but tetraploid. --K, Y, L-(NF)-SPM, NS-PEI-(NB)-Q-Alta-(BC), US, SA, Eur.

Var. Boecheri nom. n., C. irtutianum Turcz., Bull. Soc. Nat. Moscou 29: 177. 1846. See also T.W. Böcher & K. Larsen, Cytotaxonomical Studies in the Chrysanthemum Leucanthemum Complex, Watsonia 4: 11-16. 1957.

2. C. arcticum L. var. polaris (Hultén) Boivin -- (Chrysanthe du Kamtchatka). Heads much as in the last, but the foliage fleshy. Stem 1-2-(3) dm high, subscaiose or the foliage nearly all basal. Leaves long cuneate into a winged petiole, the blade coarsely toothed to lobed, and obovate to cuneate in shape. Tegules conspicuously blackish-bordered. Early to mid summer. Arctic coasts. --K-Mack-(Y-Aka), nQ-nMan, nEur.

Stat. n., ssp. polaris Hultén, Svensk Bot. Tidskr. 43: 776. 1949. The typical phase occurs west of us, in the Queen Charlotte Islands westward to eastern Asia; it

is commonly a taller plant with the leaves more deeply cut, mostly trifold to pinnatifid.

3. *C. BALSAMITA* L. f. *TANACETOIDES* (Boiss.) Boivin -- Costmary, Mint Geranium (Herbe au coq, Grand Baume) -- Numerous discoid and yellow heads in a terminal corymb. Leaves thickish, serrate, elliptic to lanceolate, the lower long petiolate and much larger, the upper somewhat glaucous. Fall. Rarely spreading from cultivation: Lloydminster. --swQ-O, S, US, (Eur).

Stat.n., *Pyrethrum Balsamita* (L.) W. var. *tanacetoides* Boiss., *Fl. Or.* 3: 346. 1875. The heads are rayed in the typical form, the latter apparently not known as an escape in Canada.

44. *TANACETUM* L.

TANSY

Ligules very short or lacking; otherwise hardly different from *Chrysanthemum*.

- a. Leaf segments 3-10 mm wide 1. *T. vulgare*
 aa. Much more finely divided, the segments about
 1 mm wide 2. *T. huronense*

1. *T. VULGARE* L. -- Tansy, English Fern (Tanaisie, Tenzé) -- Numerous yellowish-green discoid heads in a terminal corymb. Leaves pinnatifid, the primary segments pinnatifid, the ultimate lobes entire to serrate. Heads mostly less than 1 cm across, from slightly depressed to somewhat convex at center. Mid summer. Often cultivated and readily spreading to roadsides. -- Mack, (Aka), sL-SPM, NS-BC, US, Eur -- Cv. *CRISPUM* -- More deeply dissected, † bipinnatifid, the lobes overlapping, crisp and upwardly curled at the tips. Less common. -- (NS)-PEI-O, (S)-Alta-(BC).

2. *T. huronense* Nutt. (var. *bifarium* Fern., var. *floccosum* Raup, var. *monocephalum* Boivin, var. *terraenovae* Fern.; *T. bipinnatum* AA., ssp. *huronense* (Nutt.) Breitung) -- Leaves feathery, very finely dissected, tripectinatifid, the ultimate segments about 1 mm wide. Lightly to heavily tomentose stoloniferous perennial. Heads few, mostly 2-5, and usually 1-2 cm across, nearly discoid, the yellow ligules only 1-2 mm long. Mid summer. Sandy shores, infrequent. -- K-Y-(Aka), NF, NB-BC, US.

Highly variable and many phenotypes have received names. We have been unable to bring them into a satisfactory classification, although the total range is conveniently broken up in a series of discrete areas. In each area a particular type tends to dominate, such as a single large head around Hudson Bay (var. *monocephalum*), or more heavily lanate around Lake Athabaska (var. *floccosum*), or the leaves somewhat fleshy along the Pacific

Coast (T. Douglasii DC.), etc., yet each local population is highly variable, so variable indeed that its morphological originality can be accurately expressed only in terms of higher frequency of a particular phenotype in a particular area.

45. ARTEMISIA L.

WORMWOOD

Heads small and resembling Achillea. However the heads are discoid and the receptacle is not chaffy.

- a. Leaves entire to coarsely lobed Group A
 aa. Pinnatipartite to tripinnatipartite Group B

Group A

Main stem leaves varying from entire to coarsely and deeply lobed.

- a. Shrubby; leaves grayish to whitish tomentose on both faces.
 b. Leaves oblanceolate to linear, entire ...
 13. A. cana
 bb. Cuneate, the apex truncate and three-toothed 12. A. tridentata
 aa. Herbaceous.
 c. Main leaves entire, green and usually glabrous 2. A. Dracunculus
 cc. White-arachnoid below, commonly serrate to lobed.
 d. Leaves heavily grayish or whitish-arachnoid on both faces ... 11. A. ludoviciana
 dd. Less pubescent and much darker above.
 e. Leaves entire and strongly revolute 9. A. longifolia
 ee. Flat and at least the lower ones coarsely lobed 8. A. Tilesii

Group B

Leaves deeply and narrowly dissected; pinnatipartite to tripinnatipartite.

- a. Leaf segments narrow, all or mostly less than 1 mm wide, usually entire.
 b. Sterile; many ultimate segments with 1-(2) teeth 5. A. pontica
 bb. Heads normally present in season; ultimate segments entire.
 c. Whitish tomentose throughout, including the involucre 15. A. frigida
 cc. At least the involucre greenish.
 d. Branchy shrub, woody below ...
 4. A. Abrotanum

- dd. Herb, the stem not branched....
 1. A. campestris
 aa. Segments broader and mostly toothed or lobed.
 e. Leaves discolour, grayish to white-to-
 mentose below, less densely so to gla-
 brous above.
 f. Leaves petiolate, without stipu-
 les 14. A. Absinthium
 ff. Leaves sessile, the lower pair of
 segments often stipule-like.
 g. Herb 2-4-(5) dm high; leaf seg-
 ments 1-3 mm wide 10. A. Michauxiana
 gg. Much taller plant with broader
 leaf segments 7. A. vulgaris
 ee. Leaves green and similar on both faces.
 h. Heads 5-10 mm across 6. A. norvegica
 hh. Much smaller and very numerous
 3. A. biennis

1. A. campestris L. var. Wormskjoldii (Besser) Cronq. (var. spithamea (Pursh) Peck; A. borealis Pallas) -- (Aurone sauvage, Armoise rouge) -- Virgate perennial with finely dissected leaves and a narrow panicle of few heads. Tufted, with heavy rosettes, the foliage primarily basal. Leaves pinnatipartite to bipinnatipartite, green or grayish and more or less pubescent. Stems 1-3-(4) dm high. Stem leaves few. Inflorescence of uniform width, its lower branches long overtopped by the subtending leaves. Corollas usually purplish in the upper part. Mid summer. Alpine slopes and subarctic shores. --(G)-F-Aka, L-NF, Q-nO, nwS-(Alta)-BC, nwUS, (Bur) -- Var. Scouleriana (Besser) Cronq. (var. caudata (Mx.) Palm. & Stey.; A. canadensis Mx.; A. caudata Mx.) -- Taller, mostly 3-8 dm high, the stem more leafy, the inflorescence a narrow panicle with the lower branches mostly overtopping the leaves. More often biennial. Herbage mainly cauline, green and more or less pubescent. Corollas yellow, the lobes often purple-margined. Mid summer. Mostly sandy shores and open, sandy woods. --seK-Y-(Aka, L)-NF, NS, NB-BC, US -- Var. Douglasiana (Besser) Boivin (A. Bourgeauiana Rydb.; A. camporum Rydb.; A. caudata Mx. var. calvens Lunell; A. Forwoodii Watson) -- Like the last variety, but more pubescent, the herbage grayish-tomentose. Steppes and prairies, common. --Mack-Y, Q-BC, (US).
 Var. Douglasiana (Besser) stat. n., A. desertorum Sprengel var. Douglasiana Besser ex Hooker, Fl. Bor. Am. 1: 325. 1833.

A rather variable type, both in the Old World and in the New. Our three varieties are somewhat arbitrary.

By increasing the level of arbitrariness one could recognize still more segregates as we did in 1955 (two species, seven varieties). To-day we regard this earlier classification as too arbitrary, too elaborate, and hardly worth retaining.

2. A. Dracunculus L. (A. dracunculoides Pursh; A. glauca Pallas) -- Tarragon (Estragon, Herbe au dragon) -- With numerous small heads and numerous linear-ligulate, entire leaves. Stem mostly 5-10 dm high. Leaves 1.5-10.0 cm long, 1.5-4.0 mm wide, the lower ones often trifid. Mid to late summer. Steppes and hillsides. -- (Y)-Aka, wO-BC, US, (CA), Eur.

3. A. biennis W. -- (Herbe Saint-Jean) -- Biennial. Glabrous and branchy. Upper leaves linear and entire, the middle and lower pinnatipartite to bipinnatipartite, the segments mostly 2-3 mm wide, sharply and irregularly serrate to lobed. Inflorescence a panicle of numerous spiciform groups of small heads. Late summer and fall. Common on shores where apparently native; a frequent weed of disturbed soils. -- Mack, NS-BC, US, (eEur, Oc).

4. A. ABROTANUM L. -- Southernwood, Sweet Benjamin (Aurone, Citronelle) -- Perennial, woody below, and the leaf segments mostly 0.2-0.3 mm wide. Herbage puberulent, very densely so on growing parts. Otherwise much resembling A. biennis. Second half of summer and early fall. Cultivated and spreading to roadsides and waste places. --Q-Alta, (US, Eur).

5. A. PONTICA L. -- Roman Wormwood (Petite Absinthe, Plante de beauté) -- Normally sterile with us. A simple, virgate, gray-blue perennial herb growing in dense colonies. Herbage densely puberulent, the leaves whitish below. Leaves bipinnatipartite, the segments 0.5-1.0 mm wide. Panicles are rarely produced in late summer. Sometimes cultivated, long persistent and spreading vegetatively to waste places: Dauphin. -- NS, Q-Man, US, Eur.

6. A. norvegica Fries var. saxatilis (Besser) Jepson -- Heads few, largest and commonly racemose. Tufted perennial 2-5 dm high. Leaves mostly basal, bipinnatipartite, the ultimate segments entire or nearly so. Tegules broadly margined in purple black. Heads 5-10 mm wide, drooping on erect peduncles. Mid summer. Alpine slopes. --(wF), Mack-Aka, (neO), swAlta-BC, wUS, (eEur).

The typical phase of western Eurasia is a usually smaller plant, its heads tend to be larger, and the central rachis of the leaf is shorter so the limb seems almost palmately cut.

7. A. VULGARIS L. -- Mugwort (Herbe Saint-Jean, Herbe à cent goûts) -- Leaf seemingly stipulate, the lower 1-2 pairs of lobes or leaflets being borne at the base

of the petiole-like rachis. Branchy perennial. Leaves dark green and glabrous or nearly so above, white-tomentose below, pinnatifid or pinnatipartite to compound towards the base. Tegules with a deep green midnerve and white-tomentose limb. Mid summer to frost. Rare weed of waste places. --(G), NF, NS-S, BC, US, (CA), Eur.

8. A. Tilesii Led. (var. unalaschkensis Besser; A. Herriottii Rydb.) -- Very variable type, but with the stem leaves, or at least the lower ones, long-lanceolate with a few lanceolate lobes. About 1 m high. Leaves 0.5-1.5 dm long, 5-20 mm wide, white-arachnoid below, grayish tomentose above when young, becoming glabrous. Heads few to many, small to large. Sometimes resembling the last species, but lacking the stipule-like lobes. Sometimes close to the next, but the leaves thinner and often larger and at least the lower ones lobed. Mid summer. Open woods and river flats. --(wF)-K-Aka, wQ-BC, (US), nEur.

A rather polymorphic type, perhaps divisible in two or three geographical variants. We have not yet been able to establish or recognize a sound morphological basis for the distinction of such variants.

9. A. longifolia Nutt. -- Linear leaves strongly revolute and white-arachnoid below. Densely tufted from a woody base and taproot. Leaves (2)-3-5-(8) mm wide, thickish, lightly arachnoid above, entire. Stem simple, 3-8 dm high. Involucre arachnoid. Mid summer. Wind eroded steppes and badlands or lightly alkaline soils. -- sMan-sBC, US.

Has been recently detected west of us at Osoyoos (DAO), Kelowna (DAO) and Summerland (UBC). The Ontario report by Fernald 1950, repeated by Scoggan 1957, queried by Boivin 1967, is to be discounted as it could not be substantiated at GH or elsewhere.

10. A. Michauxiana Besser -- Segments of the lower pair stipule-like as in A. vulgaris, but the stem shorter and simple and the leaf segments narrower. With a taproot and somewhat stoloniferous, forming loose colonies. Leaves green above, white-arachnoid below, pectinatipartite to bipectinatipartite, the segments 1-3 mm wide. Inflorescence very narrow, sometimes subspiciform. Early summer. Gravels and rocky exposures at mid altitude. -- swAlta-BC, wUS.

11. A. ludoviciana Nutt. var. ludoviciana (var. gnaphalodes AA., var. latifolia (Besser) T. & G.; A. diversifolia Rydb.; A. gnaphalodes AA.; A. Purshiana Besser) -- Sage, White Sage -- Long stoloniferous. Leaves mostly 1 cm wide, lanceolate, grayish to white-tomentose on both faces, entire to paucidentate towards the apex. Heads arachnoid with a purplish or brownish disk. Late summer.

Prairies and open places, common. --sMack, PEI-BC, US--
 Var. gnaphalodes (Nutt.) T. & G. (A. pabularis (Nelson)
 Rydb.) -- Smaller and often yellowish-pubescent. Leaves
 ± linear, 3-5 mm wide, most often conduplicate. Steppes.
 --swQ-Alta, US.

With us this is essentially a native plant, but its
 occurrence in Eastern Canada is mainly in the form of a
 not particularly aggressive weed invading open places.

The type of Artemisia gnaphalodes Nutt. (PH) is the
 narrow-leaved phase commonly treated as A. pabularis (Nel-
 son) Rydb., while the type of A. ludoviciana (also PH)
 is merely a sterile shoot of the broader leaved phase col-
 lected late in season and somewhat glabrescent above as
 often happens in what is usually called A. gnaphalodes.
 Hence the shift in names and the usage adopted here, in
 which var. gnaphalodes becomes the correct name for the
 narrow-leaved phase.

12. A. tridentata Nutt. var. tridentata -- Sage-
 brush (Absinthe) -- Leaves narrowly cuneate, three-too-
 thed at apex. Shrubby. Herbage grayish-tomentose throug-
 hout. Heads numerous and small. Late summer and fall.
 Steppes along the South Castle Creek in the Crowsnest
 Area. swAlta-sBC, US, (CA).

Involucre 3-4 mm high. At Hedley B.C. (DAO) and
 south there occurs a var. Vaseyana (Rydb.) stat. n., A.
Vaseyana Rydb., N. Am. Fl. 34: 283. 1916, with somewhat
 larger heads, the involucre ± 5 mm high.

13. A. cana Pursh -- Wild Sage -- Shrubby with nar-
 row and entire leaves equally whitish-tomentose on both
 faces. Panicle leafy, the leaves mostly overtopping the
 flowering branches. Late summer and early fall. Dry hills
 and steppes. --swMan-sAlta, US.

14. A. ABSINTHIUM L. var. INSIPIDA Stechmann --
Wormwood, Absinth (Absinthe) -- Leaves grayish-
 tomentose and pinnatifid to nearly tripinnatifid into li-
 gulate and subentire segments about 2-4 mm wide. Panicle
 ample with numerous drooping hemispheric heads about 4 mm
 wide. Mid summer to fall. Cultivated and casually spread-
 ing to roadsides, etc. -- (NF-SPM), NS-(PEI)-NB-BC, US,
 Eur.

15. A. frigida W. -- French Sage, Prairie-Sage-
wort -- Foliage whitish and finely divided, the leaves
 rather short. Tufted perennial, white-silky throughout.
 Leaves less than 2 cm long, pinnatifid to bipinnati-
 partite, the segments entire and less than 1 mm wide.
 Second half of summer. Vary common in steppes and prai-
 ries. --Mack-Aka, NB-BC, US, Eur.

Essentially a prairie species, it is known in Eas-
 tern Canada as a sporadic introduction, but is perhaps
 also native at a few spots on Lake Superior.

46. PETASITES Miller SWEET COLTSFOOT
 Resembles Senecio. Flowering stems shedding their

seeds and evanescent by the time the basal leaves are fully grown. Plants subdioecious. Stem leaves very much reduced.

Species of this genus present some unusual and inherent difficulties of identification, partly because of the alternance of biological phases. Most specimens will represent only one phase and the correlation of characters is difficult to establish. Then herbarium specimens showing both phases are a small minority and in most cases the two phases are not root-connected, leaving open the possibility that they may have come from different clones, perhaps different species.

Many specimens have turned up identified or revised to various hybrid combinations. We have studied a fair number of such specimens at DAO, UBC and V, and we are not fully satisfied that their morphology could justify the postulate of hybridity. Most such specimens have been revised or returned to P. vitifolius, others to P. sagittatus or P. palmatus. However we have not yet seen the many Yukon and Alaska intermediates discussed by Hultén 1950.

a. Leaves suborbicular, palmatifid3. P. palmatus
aa. Deltoid to sagittate, undulate to lobed.

b. Deltoid and deeply lobed 2. P. vitifolius

bb. Sagittate, the margin undulate to coarsely dentate 1. P. sagittatus

1. P. sagittatus (Banks) Gray -- Like the next two, but the leaves triangular-sagittate, 1-2 dm long, deeply cordate at base, the margin sinuate to dentate. Stems arachnoid-pubescent, not glandular. Pappus 15-22 mm long. First half of spring. Wet places. -- (seF)-K-Aka, L, Q-BC, US.

The more northern P. frigidus (L.). Fries was mapped by Porsild 1957, 1964, showing an unlikely dot near Jasper, but was not listed by Porsild 1959. The specimen basis of the dot could not be determined positively.

2. P. vitifolius Greene (P. frigidus (L.) Fries var. nivalis (Greene) Cronq.) -- Like the next. Leaves deltoid, deeply cordate, irregularly lobed and dentate, about as wide as long, sometimes up to 2 dm across, but mostly under 1 dm wide. Stem both arachnoid and glandular. Pappus 12-15 mm long. Spring. Wet or boggy places. --(sK)-Mack-Aka, (L), Q-BC, US.

3. P. palmatus (Aiton) Gray var. palmatus (P. frigidus (L.) Fries var. palmatus (Aiton) Cronq.) -- Herb at first producing a simple flowering stem with leaves reduced to large dilated stipules and a dense raceme elongating in fruit. Leaves appearing later in early summer only. Stoloniferous. Stem 2-6 dm high, glandular-pubes-

cent, rarely slightly arachnoid. Leaves up to 2 dm across, suborbicular, palmatifid. Heads short ligulate; involucre up to 1 cm high, ligules yellowish, pappus 8-12 mm long. Spring. Frequent in low places. --(sK)-Mack-Y, L-NF, NS-neBC, neUS.

A report of the related genus Erechtites hieracii-folia (L.) Raf. by Macoun 1884 was based on a mention by Hooker 1834 of Senecio hieraciifolius L. from Saskatchewan. This has never been confirmed and was not accepted by later authors.

47. ARNICA L.

ARNICA

Leaves opposite, otherwise as in Senecio. Tegules isomegueth.

- a. Leaves cordate to narrowly oblong.
 - b. Larger stem leaves broadly cordate and long petiolate, the petiole mostly about as long as the blade; achene abundantly short hirsute 8. A. cordifolia
 - bb. Stem leaves oblong to ovate-oblong, subcordate to cuneate at base; petiole less than half as long as the blade.
 - c. Pappus pale brown; leaves closely and sharply dentate 11. A. diversifolia
 - cc. White; leaves somewhat remotely serrate or denticulate; achenes usually glabrous 7. A. latifolia
- aa. Narrower, oblong-lanceolate to linear.
 - d. Stem leaves in (1)-2-3-(rarely 4) pairs ..
..... Group A
 - dd. Stem leaves in (4)-5-6-(8) pairs.
 - e. Leaves closely and sharply dentate ..
..... 11. A. diversifolia
 - ee. Entire to remotely denticulate.
 - f. Tegules lanate-ciliate at tip..
..... 9. A. Chamissonis
 - ff. Tegules much more sharply acute and the ciliation not unusually dense at tip.
 - g. Leaves entire or nearly so; tegule pubescence entirely or essentially of short glandular hairs..... 10. A. longifolia
 - gg. Leaves remotely denticulate; tegule pubescence primarily villous 12. A. mollis

Group A

Stem leaves rather narrow and few; mostly in (1)-2-3 pairs and broadly lanceolate to linear. Pappus mostly

white.

a. Heads discoid; pappus pale brown 13. A. Parryi
 aa. Heads radiate.

b. Heads at first nodding; achene glabrous
 or finely glandular below the middle,
 sparsely pilose above 2. A. louiseana

bb. Erect; achene uniformly pilose; mostly
 taller plants.

c. Leaves remotely and regularly den-
 ticulate with distant and subopposi-
 te teeth.

d. Pappus white 3. A. lonchophylla

dd. Pale brown; tegules longer ...

..... 12. A. mollis

cc. Leaves entire or irregularly and remotely
 denticulate.

e. Tegules 9-11 mm long; leaves
 broadly lanceolate 4. A. Rydbergii

ee. Tegules 11-15 mm long.

f. Leaves 1-4 cm wide and near-
 ly uniform in length but the
 middle ones somewhat longer ..
 12. A. mollis

ff. Much reduced upward, the lo-
 west at least twice longer
 than the upper, also mostly
 narrower and lanceolate to
 linear.

g. Rhizome with tufts of long,
 brown hairs; leaves \pm oblan-
 ceolate, the lower at least
 1 cm wide 5. A. fulgens

gg. Rhizome without tufts; leaves
 lanceolate to linear and not
 over 1 cm wide.

h. Ligules light yellow; te-
 gules somewhat acuminate,
 often purplish and squar-
 rose at tip 1. A. alpina

hh. Ligules orange-yellow; te-
 gules broadly acute at tip
 and green 6. A. sororia

1. A. alpina (L.) Olin var. ungavensis Boivin (ssp. attenuata (Greene) Maguire; A. attenuata Greene) -- A middling type, 1-3 dm high with 2-3 pairs of stem leaves and usually only 1 head. Leaves usually less than 1 cm wide, linear-lanceolate, acuminate, entire. Involucre obviously glandular-puberulent and lightly villous, more densely so towards the base. Pappus clean white. Mid

summer. Tundra and rocky alpine slopes and summits. -- K-Aka, L-(NF), nQ-nMan-(nS)-swAlta-nBC -- Var. vestita Hultén (var. tomentosa (J.M. Macoun) Cronq.) -- Densely soft lanate, especially on the tegules and the base of the involucre. Tegules also abundantly, but not obviously, short glandular-pubescent under the heavy lanosity. Ligules rather short, usually of about 1 cm. Less common. --(Mack-Y)Aka, (wNF), swAlta-(BC, nwUS).

Var. ungavensis (Boivin) stat. n., A. Sornborgeri Fern. var. ungavensis Boivin, Nat. Can. 75: 211. 1948.

2. A. louiseana Farr var. louiseana -- Smaller than the last, usually around 1 dm high. Leaves broader, mostly 1-2 cm wide, \pm lanceolate and not acuminate, mostly basal, the stem usually bearing only 1 reduced pair. Head nodding at anthesis and usually solitary. Mid summer. Shale slides at high altitudes in the Banff area. --Y, swAlta-neBC.

Vicariant of the eastern var. Griscomii (Fern.) stat. n., A. Griscomii Fern., Rhodora 26: 105. 1924, from Gaspé and Newfoundland. The latter has erect heads at anthesis. Also it is a somewhat taller plant and its achenes are slightly shorter.

3. A. lonchophylla Greene var. lonchophylla (A. arnoglossa AA.) -- Resembles A. alpina, but somewhat larger and the leaves are remotely denticulate with a few pairs of subopposite teeth. Mostly (2)-3-4-(6) dm high. Upper leaves much reduced and usually entire, the basal ones with a petiole at least half as long as the blade. Involucre often shorter. Early summer. Near shores in limestone regions. --(swK)-Mack-Y, NF, NS, NB-Alta, ncUS.

In ours the herbage is both glandular and long pilose. In the more southern var. arnoglossa (Greene) Boivin the glandulosity is more abundant and obviously dominant while the pilosity is much shorter and scanty, the contrast is especially strong on the tegules where the longer hairs are quite lacking or nearly so.

4. A. Rydbergii Greene -- Somewhat halfway between A. alpina and A. latifolia. Loosely tufted and 1.5-2.5 dm high. Stem leaves mostly 2 pairs of which the upper are broadly lanceolate, the lower broadly oblanceolate, entire to irregularly denticulate. Head usually solitary, the involucre rather short. Pappus clean white. Summer. Low alpine, mostly on shale slides. -- swAlta-(eBC), nwUS.

5. A. fulgens Pursh -- Rhizome with many tufts of long, brown hairs. Pubescence dense, primarily glandular and lightly tinted. Stem leaves 2-3 pairs, the upper much reduced, the lower 2-4 times longer, oblanceolate, entire to irregularly denticulate. Head usually solitary and on a peduncle usually longer than any of the interno-

des. Outer tegules up to 2.5-3.5 mm wide. Early summer. Shallow depressions in the steppe. Infrequent but showy. --swMan-eBC, US.

6. A. sororia Greene --Closely resembling the last, but lacking the tufts of brown hairs at the base of the stem and on the rhizome. Lower leaves not so clearly oblanceolate and tending to narrower, usually less than 1 cm wide. Peduncles less elongate, often shorter than any of the internodes. Tegules somewhat narrower, (1.0)-2.0-(2.5) mm wide. Early to mid summer. Foothill prairies and open montane woods. --sAlta-sBC, (wUS).

7. A. latifolia Bongard (A. gracilis Rydb.) -- A rather large-leaved species with typically two pairs of stem leaves of which the lower are serrate, + oblong and rounded at base to a winged petiole. Basal leaves sometimes cordate. Stem 2-6 dm high. Involucre rather narrow and high, the tegules 12-18 mm long. Pappus pure white. Achaine commonly glabrous, sometimes sparsely puberulent in the upper half, more rarely minutely glandular. Early to mid summer. Wetter montane forests. --swMack-Aka, swAlta-BC, wUS.

Plants from higher altitudes tend to be generally smaller, including smaller heads. A number of names have been proposed for this ecological extreme, the latest being var. gracilis (Rydb.) Cronq. An essentially parallel variation occurs under the next species: var. pumila (Rydb.) Maguire is available to single out such smaller variants of higher altitudes.

8. A. cordifolia Hooker -- A rather showy forest species resembling the last, yet the basal and lower leaves deeply and broadly cordate. Head mostly 5-6 cm across. The petioles elongate and not winged. Tegules 12-20 mm long, 3-5 mm wide, oblanceolate. Pappus white. Late spring to mid summer. Lodgepole forests; common at low altitudes in the Rockies, highly disjunct eastward. --swMack-Y, Man-BC, US.

Recently discovered in the Riding Mountain area (Rassburn Tower Cabin), this cordillerian species also occurs east of the Rockies in a rather unusual and highly disjunct manner: Wintering Hills, Cypress Hills, Pasquia Mountain and Riding Mountain. Also south of the border in the Sweetgrass Buttes of Montana, the Black Hills of South Dakota and the Keweenaw peninsula of Michigan. Many of these isolated localities are in recently glaciated territory, which would indicate a species enjoying a range expansion in earlier post-glacial times followed with a regression to the present highly sporadic condition.

Reports of A. cordifolia for southeastern Alaska by Maguire 1943, Hultén 1950, Anderson 1952, Gleason 1952, Cronquist 1955, queried by Boivin 1967, are apparently

in need of confirmation. The original report was based on a collection by Cushing from Muir Glacier and two Krause collections from Tlehini and Klokwan. The Muir Glacier collection (CU) has the short petioles, the triangular-oblong leaves with broadly cordate base and the small size typical of A. latifolia var. gracilis, and has been revised accordingly. It is not possible to state if the Krause collections should be similarly revised as these were preserved at the Berlin Botanical Garden and were presumably lost in the fire that destroyed their herbarium.

The Keweenaw plant has been described as a separate species, A. Withneyi Fern., which differs in no substantial way from the cordilleran plant, yet the limited Keweenaw populations exhibit, as would be expected, a narrower range of variation than the multitude from the Rockies and westward. Such a restricted type has no taxonomic value by the mere fact of its restricted range and variation. The other 6 isolated localities also support populations of similarly restricted range and variation and would also rate taxonomic rank if either limited variability or localized occurrence were taxonomic characters per se, a situation where the place of collecting would actually become the primary taxonomic criterion.

9. A. Chamissonis Lessing (var. angustifolia Herder, var. incana (Gray) Hultén, ssp. foliosa (Nutt.) Maguire; A. foliosa Nutt.)-- Stem leaves more numerous, mostly in 4-5 pairs. Long stoloniferous and (3)-4-6-(8) dm high. Leaves \pm lanceolate, 1-5 cm wide, remotely denticulate or entire, commonly about as long as the internodes. Lower part of stem often purple. Herbage abundantly long villous and glandular-puberulent. Heads mostly 3-5, corymbose. Tegules broadly acute and lanate-ciliate at tip. Pappus pale brown to nearly white. Mid summer. Low lying patches in black soil regions. --sMack-sAka, wcQ-BC, wUS.

Some average differences are fairly obvious when specimens from opposite ends of the range are contrasted. Thus Alaska specimens (var. Chamissonis) tend to larger stem leaves, (1.5)-2.0-3.5-(5.0) cm wide, more obviously toothed, the pappus usually tawny, varying to nearly white, and Ontario specimens (var. angustifolia Herder) have narrower leaves 1.0-2.0-(3.5) cm wide, entire to weakly toothed, the pappus mostly nearly white. The California specimens (var. incana (Gray) Hultén) are often quite heavily tomentose. However these morphological types are merely statistical variants, they occur with greater frequency in one area without being completely absent from the rest of the range. Most specimens have leaves about 2 cm wide, pappus light tawny, and average

tomentum; it is difficult to sort them out into geographical variants without undue emphasis on the place of collecting. Certainly, a realistic sorting of the material at hand would not achieve the strong geographical restrictions illustrated by a dot map in Brittonia 4: 462. 1943.

The extreme with dense and felty tomentum could be regarded as an ecological form (= f. incana (Gray) Boivin) of wetter years, often found standing in shallow water. The evidence at hand is still too scanty to be conclusive.

10. A. longifolia D.C. Eaton -- Involucre not villos at base, or only slightly so. With 5-8 pairs of stem leaves, lanceolate to narrowly lanceolate, thus resembling the last, but greener, the dense and short glandulosity not being mixed with any villosity. Leaves entire to remotely denticulate, at least as long as the internodes and commonly twice longer, the upper often overtopping the heads, the basal ones absent at flowering. Late summer. Forming large patches along subalpine creeks in Waterton. --swAlta, wUS.

11. A. diversifolia Greene -- Leaves closely and very sharply dentate, the sinuses rounded. Stem leaves mostly in 5 pairs, the larger ones \pm ovate, the others gradually shorter and much narrower, mostly petiolate, the petioles winged. Herbage lightly villous and densely glandular-puberulent throughout. Pappus pale brown. Mid summer. On wet cliffs and along subalpine creeks. --(Y)-seAka, swAlta-BC, wUS.

12. A. mollis Hooker var. mollis (A. lanceolata Nutt.) -- A middling and non-descript type with 3-4 pairs of stem leaves, nearly entire to serrate, \pm lanceolate, 1-4 cm wide. Pubescence mixed, partly glandular-puberulent, partly villous or glandular-villous. Pappus pale brown. Second half of summer. Wet or boggy places in the mountains. -- (swMack-seY), nNB-seQ, swAlta-sBC, wUS -- Var. aspera (Greene) Boivin (A. amplexicaulis Nutt.) -- More leafy, mostly with 5-6 pairs of stem leaves. -- (wMack, seAka), swAlta-BC, wUS.

Var. aspera (Greene) stat. n., A. aspera Greene, Ott. Nat. 15: 281. 1902.

Another variant from the U.S. Northwest is var. Piperi (St. John & Warren) stat. n., A. amplexicaulis Nutt. var. Piperi St. John & Warren, Proc. Biol. Soc. Wash. 44: 36. 1931, distinguished mainly by its more ample foliage, the leaves up to 4-6-(8) cm wide.

One of the more remarkable cases of range disjunction in North American, widely distributed in the Rockies and again around the Gulf of St. Lawrence. A Great Lakes report by Macoun 1903 was based on a sheet

labelled, R. Bell, Gros Cap, July 25, 1860 (QK); it is to be discounted as the specimen belongs to Coreopsis lanceolata var. lanceolata.

13. A. Parryi Gray var. Parryi -- Discoid. Similar in habit to A. fulgens. Lower and basal leaves lanceolate, broadest near the base, long petiolate. Middle and upper stem leaves strongly contrasting, less than half as long and sessile. Heads commonly 3-5 and fairly large, but rayless. Mid summer. Mountain meadows towards timberline. --(Y), awAlta-sBC, wUS.

In the more southern var. Sonnei (Greene) Cronq. the heads are radiate.

48. SENECIO L.

GROUNDSEL

Mostly a conspicuous herb with yellow heads in a terminal corymb, often in an umbelliform corymb. A basic type, resembling Solidago with its yellow flowers and ligules and its pappus of bristles, but the tegules isodimegueth and more or less in a single row, or sometimes dimegueth, the outer ones few in number and many times shorter than the inner.

- a. Monocephalous or annual Group A
- aa. Perennial and polycephalous.
 - b. Leaves subentire to dentate Group B
 - bb. Some or all leaves coarsely lobed to pin-natifartite Group C

Group A

Annual herbs, usually polycephalous. Or perennial but monocephalous or sometimes with a second smaller head.

- a. Annual.
 - b. Annual from a bulbous base with fasciculate rootlets 4. S. congestus
 - bb. Annual with a taproot.
 - c. Herbage nearly glabrous; outer tegules black-tipped 1. S. vulgaris
 - cc. Herbage heavily glandular; all tegules green to the tip 2. S. viscosus
- aa. Perennial.
 - d. Leaves subentire; head largest 5. S. megacephalus
 - dd. Lower stem leaf deeply lobed 17. S. resedifolius

Group B

Leaves subentire to dentate or serrate.

- a. Head largest, solitary or nearly so 5. S. megacephalus

- aa. Polycephalous, with more than 2 heads.
 b. Leaves † isomegueth, † truncate at base ..
 7. S. triangularis
- bb. Lower leaves long cuneate at base.
 c. Upper stem leaves sessile but other-
 wise not much smaller than the lower
 ones.
 d. Stem leaves much shorter than
 the internodes and much narrower
 than the rosette leaves
 11. S. streptanthifolius
- dd. Stem leaves rather longer than
 the internodes.
 e. No rosette leaves; main stem
 leaves † obovate..... 6. S. Fremontii
- ee. Rosette present; stem leaves
 lanceolate or oblanceolate ..
 16. S. tridenticulatus
- cc. Middle and upper stem leaves less than
 half as long as the lower ones.
 f. Heads in a corymbiform raceme, ra-
 rely somewhat compound; herbage †
 villous or tomentose, at least in
 the inflorescence..... 9. S. integerrimus
- ff. Outer branches bearing short ra-
 cemes of 2-5 heads; herbage gla-
 brous or lightly pubescent in
 the inflorescence 8. S. foetidus

Group C

Polycephalous perennials with leaves more deeply dissected. At least the stem leaves coarsely lobed towards the base, more commonly pinnatifid to pinnatipartite.

- a. Leaves all alike.
 b. Herb 3 dm high or less; leaves slightly
 fleshy, dentate to lobed ..16. S. tridenticulatus
- bb. Much taller herb; leaves thin and more
 deeply dissected..... 3. S. eremophilus
- aa. Leaves polymorphic: rosette leaves larger and
 usually merely dentate; stem leaves more deep-
 ly dissected, the upper ones smaller.
- c. Basal leaves cuneate at base, usually less
 than 2 cm wide.
 d. Herbage grayish to whitish-tomentose, but
 the leaves sometimes green above.... 10. S. canus
- dd. Herbage less pubescent and green throughout.
 e. Rosette leaves uniformly crenate or
 serrate to base 12. S. pauperculus

ee. Mostly with only 3-5 teeth towards

the apex 11. S. streptanthifolius

cc. At least the larger leaves subtruncate to cordate or broadly rounded at base.

f. Larger leaves cordate or ovate to reniform; heads radiate; tegules green ...

..... 13. S. aureus

ff. Larger leaves more or less truncate at base; heads radiate or eradiate; tegules † purplish.

g. Herb 2-4 dm high; basal leaves 1-3

cm long 15. S. pauciflorus

gg. Taller and the leaves larger

..... 14. S. indecorus

1. S. VULGARIS L. -- Groundsel (Grand mouron, Toute venue) -- Main tegules green, but the outer short tegules black in the upper third. Leaves † oblanceolate, irregularly lobed to pinnatifid, the lobes irregularly dentate. Discoid. All summer. Casual weed, rarely abundant. -- (G), Mack-(Y)-Aka, L-SPM, NS-BC, US, Eur.

2. S. VISCOSUS L. -- Stinking Groundsel -- Closely resembling the first, but densely glandular puberulent. Inner tegules with a small brown spot at tip; outer ones green. Ligules very short, the heads almost discoid. Second half of summer and fall. Rare weed of disturbed soils: Winnipeg. -- (NF), NS-Man, BC, (US), Eur.

3. S. eremophilus Rich. var. eremophilus -- No rosettes, but the stem leaves numerous and pinnatifid to pinnatipartite. Fairly showy tufted perennial, (0.6)-1.0-(1.5) m high. Leaf lobes narrower than the sinuses. Heads fairly large and long ligulate. Tegules finely tipped in black. Mid summer. Wetter spots at edge of forests. -- sMack, O-BC, US.

In the southern Rockies our plant gives way to var. Kingii (Rydb.) Greenm. with smaller heads, the involucre only 5-7 mm high, the tegules more conspicuously black-tipped.

4. S. congestus (Br.) DC. (var. palustris (L.) Fern., var. tonsus Fern.; S. palustris (L.) Hooker) -- Marsh-Fleabane -- Annual from a bulbous base. Long-lanate throughout. Stem thick, hollow, up to 1 m high, but usually much smaller. Bulb also hollow. Stem leaves numerous, undulate to pinnatifid. Heads in clusters. Ligules short. Late spring to mid summer. Exundated places. -- F-Aka, L, Q-Alta-(BC), ncUS, Eur.

5. S. megacephalus Nutt. -- Heads largest, 2.0 - 2.5 cm high, and usually solitary or sometimes with a second smaller one borne on a longer peduncle. Herbage tomentose-floccose, especially along the leaf margins.

Leaves entire to dentate, oblanceolate, the upper much reduced. Mid summer. Alpine ridges in Waterton. -- swAlta-seBC, nwUS.

6. S. Fremontii T. & G. var. Fremontii -- A tufted perennial, somewhat fleshy, 1-2 dm high, with a taproot. Herbage glabrous. Basal leaves lacking, the stem leaves fairly uniform, narrowly obovate, dentate. Heads few, mostly 2-3 per stem. Longer tegules of two kinds; every other one broadly hyaline-margined, the others with a narrow margin in pale green. Second half of summer. Rocky alpine slopes. --swAlta-seBC, wUS.

The californian var. occidentalis Gray is more slender and less sharply toothed, while var. blitoides (Greene) Cronq. of the southern Rockies is more robust and its broader leaves are more sharply toothed.

7. S. triangularis Hooker -- Stem leafy with numerous triangular leaves 5-12 cm long, sometimes broadly cuneate but usually truncate at base, serrate at margin. Ligules few and rather long. Otherwise pretty much like S. eremophilus. Mid summer. Open mountain woods and low alpine meadows. --Mack-Aka, swAlta-BC, nwUS.

8. S. foetidus Howell (S. hydrophiloides Rydb.) -- Similar to the next but the lower and basal leaves closely and sharply serrate. Generally larger, especially the basal leaves. Herbage quite glabrous. Tegules with a conspicuous, triangular, black tip. First half of summer. Along low montane creeks -- swAlta-sBC, nwUS.

S. hydrophiloides was some years ago reduced in rank as S. foetidus var. hydrophiloides (Rydb.) Barkley and discussed in Leaflet West. Bot. 9: 103-4, 1960. The more southern and more western parts of the range are said to be restricted to var. foetidus with more numerous heads in an irregular compound corymb of small clusters, the peduncles mostly shorter than the heads. Allowing for a broad zone of overlap, the more northern and the more eastern parts of the range are reputedly occupied by var. hydrophiloides with fewer heads borne in a nearly simple corymb, most peduncles longer than the heads.

Of the four Canadian collections examined, the one from Rossland, B.C., (CAN) fits the distributional pattern by having the morphology of var. hydrophiloides, but the Alberta collections from Milk Range (CAN), Camp Impeesa (DAO) and Waterton (CAN) have the more numerous and clustered heads of var. foetidus. Obviously the Canadian material does not fall into the proposed pattern of geographical varieties. The U.S. material at hand is not sufficient to enable us to form a firm opinion on the tenability of these variations south of our borders.

9. S. integerrimus Nutt. var. integerrimus -- Leaves entire or remotely denticulate in the manner of

some Arnica. Herbage + tomentose or villous, at least in the axilla and at the base of the heads. Lower and basal leaves lanceolate, commonly around 1 dm long, the middle and upper ones much reduced. Tegules green to the tip. Ligules yellow. Early summer. Wet or sandy meadows, infrequent and mainly more southern. --Man-BC, US -- Var. exaltatus (Nutt.) Cronq. (S. columbianus Greene; S. exaltatus Nutt.; S. Scribneri Rydb.)-- Tegules with a small black patch at tip, the black patch 1 mm long or less, mostly lanceolate. --S-BC, wUS -- f. ochroleucus (Gray) Boivin -- Ligules paler, white to cream: Manyberries. --Alta-(BC, US) -- Var. lugens (Rich.) Boivin (S. lugens Rich.) -- Black patch larger and more conspicuous, triangular to deltoid and about 2 mm long. -- Mack-Aka, Alta-BC, nwUS.

Var. exaltatus (Nutt.) Cronq. f. ochroleucus (Gray) stat. n., S. lugens Rich. var. ochroleucus Gray. Syn. Fl. 1,2: 388. 1884.

Var. lugens (Rich.) stat. n., S. lugens Rich., Bot. App. to Franklin's Narrative 747-8, 1823.

Var. Parryi D.C. Eaton (=var. exaltatus) was reported by Dawson 1875 for west of the Turtle Mountain towards the first crossing of the Souris river, but the corresponding collection (DAO) belongs to var. integerrimus. See also Scoggan 1957 sub S. pauperculus. To our knowledge, all Manitoba specimen of S. integerrimus belong to the typical variety.

10. S. canus Hooker (S. Purshianus Nutt.) -- Herbage more or less grayish-tomentose. Basal leaves all or mostly entire. Otherwise similar to S. pauperculus var. thompsoniensis. First half of summer. Steppes on hill-sides, frequent. -- (O)-Man-BC, US.

Reputedly introduced eastward in Ontario, but we have yet to see a specimen.

11. S. streptanthifolius Greene (S. cymbalaroides Nutt., var. borealis (T. & G.) Greenman; S. obovatus AA.) -- Lower and basal leaves slightly fleshy, entire except for 3-(5) apical teeth. Otherwise similar to the next. Drier prairies. Late spring and early summer. -- sMack-sAka, nwS-BC, wUS.

S. aureus var. borealis T. & G. was reported by Macoun 1884 for the North West Angle of the Lake of the Woods. This locality is in Minnesota, the Angle being a small geographical inset along the Ontario-Manitoba boundary. The specimen (CAN) was correctly identified and would to-day be called S. streptanthifolius; it was so revised by T.M. Barkley in 1960. However the locality is far out of range and has never been confirmed, raising the suspicion that the label data could be erroneous.

12. S. pauperculus Mx. var. pauperculus (S. Balsamitae Muhl.) -- A middling type, forming an intergrading series with the last two and the next four species. Loosely tufted, (2)-4-(6) dm high, glabrous or tomentose in the leaf axils. Leaves strongly dimorphic; the lower and basal oblanceolate to obovate, mostly 1 cm wide or slightly less, petiolate, crenate or serrate and often pinnatifid towards the base; middle and upper leaves sessile, pinnatifid towards the base. Involucre 4-5 mm high. Early summer. Wet sandy soils and limestone flats in open places. --K-(Mack-Aka), L-NF, NS-Man, US -- Var. firmifolius Greenman (var. flavovirens (Rydb.) Boivin, var. thompsoniensis AA.; S. Tweedyi Rydb.) -- Heads larger, the involucre 5-7 mm high. Herb tending to be larger throughout. Wet meadows. --K-Mack, NF, Q-BC, US -- Var. thompsoniensis (Greenman) Boivin (S. plattensis Nutt.) -- Herbage more or less floccose-tomentose. Stem leaves more often pinnatifid to pinnatipartite for their whole length. Basal leaves usually larger, commonly 1-2 cm wide, crenate to lobed. Heads larger, as in var. firmifolius. -- sMack, O-BC, cUS.

Our Canadian material is fairly readily divisible into three geographical variants, give or take a few intermediates. The more eastern plants are generally smaller and smaller-headed, they constitute the typical variety. The common type in our forested areas, common westward and northward, becoming very local eastward, is a somewhat larger plant with larger heads; it may be known as var. firmifolius. More pubescent plants from the prairie regions and southward are referable, sometimes arbitrarily so, to var. thompsoniensis. All specimens under S. pauperculus at DAO, MT, MTMG, and QFA from west and north of Manitoba were revised to other taxa, mainly to var. firmifolius. Perhaps the western material in other herbaria should be similarly revised and the Mack-Y-Aka reports discounted, just as we are discounting all reports of S. paupercula proper from Saskatchewan and westward.

Canadian reports of, and identifications as, S. Balsamitae generally refer to somewhat larger plants from any of our three varieties, mostly of var. pauperculus.

Var. firmifolius (1905) is apparently the earlier name for the larger-headed plant which we had previously called var. flavovirens (1948) and was called var. thompsoniensis (1911) by Cronquist 1955.

Macoun 1884 reports Senecio aureus L. var. obovatus (Muhl.) T. & G. (S. obovatus Muhl.) as occurring from Nova Scotia to B.C. and throughout the prairie regions. Modern collections show that in Canada, S. obovatus is restricted to two limited areas in Ontario and Québec and Macoun's report for our area is no doubt to be discounted, even if

we have not yet investigated its specimen basis. We expect that most of his western specimens will belong to S. pauperculus var. firmifolius or to S. aureus.

13. S. aureus L. (S. pseudopareus Rydb., var. semicordatus (Mack. & Bush) Barkley) -- Spring-Avens, Squaw-Weed -- Basal leaves large and short, reniform or broadly ovate to cordate, mostly 2-5 cm wide and broadest at the base which is mostly cordate to truncate or broadly cuneate. Involucre 5-8 mm high. Otherwise similar to the var. firmifolius of the last. First half of summer. Wet meadows. -- NF-SPM, NS-sMan-swS-Alta(ae, sw)-BC, US.

A troublesome name, often misapplied, so that literature records should not be trusted too eagerly. Thus the long-standing Labrador record turned out to be based on two Forteau collections (QK) which proved to belong to S. pauciflorus and S. pauperculus respectively.

A highly variable species, difficult to define, not always clearly distinct from its relatives. Numerous variants have been defined and many of these will form the dominant facies of the species in a particular region, but as far as we can determine these variants have primarily a statistical value, being quite common in a particular part of the range, sporadic or local elsewhere.

East of us nearly all specimens of S. aureus have obviously cordate basal leaves and are thus readily distinguished from S. pauperculus; the latter is also noted for its smaller heads and narrower leaves ± cuneate at base. But in our area where the local variant of S. pauperculus is the larger-headed var. firmifolius and where the local facies of S. aureus is a somewhat smaller plant with basal leaves less often cordate than not, the distinction is less obvious and at times merely arbitrary.

The latest student of the group, Barkley 1962, subdivided our Canadian material into three taxa as follows. The more deeply cordate basal leaves characterize the eastern S. aureus, while in the western S. pseudopareus they are truncate or merely subcordate at base. The eastern phase of the latter is distinguished as var. semicordatus (= S. aureus var. semicordatus (Mack. & Bush) Greenman) in which the basal leaves have rounded teeth. This occurs in southern Manitoba and southward. The more western and typical phase of S. pseudopareus has acutely serrate basal leaves and occurs from Alberta westward. Grosso modo, these distinctions can be applied to our specimens, and so can Fernald's subdivision of the eastern material into five varieties. But either classification leaves behind a large residue of atypical or out-of-range specimens.

To illustrate the low level of conformity between the actual specimens and the described standards, we are

reproducing a count of heads on a series at hand of 18 Alberta and B.C. collections comprising 40 flowering stems. In that area only typical S. pseudoaureus is supposed to occur and it should bear 12-20 heads, as contrasted with the more eastern var. semicordatus bearing only 6-12 heads per plant. The result is as follows in which the first figure is the number of heads, and the figure in brackets is the number of plants from Alberta and B.C. bearing said number of heads: 2(1)--3(6)--4(4)--5(2)--6(6)--7(4)--8(3)--9(4)--10(1)14(2)--15(2)--16(2)--17(1)--20(1)--22(1). Clearly we have two series here: 31 plants have 2 to 10 heads per inflorescence and would be better placed with the Manitoban var. semicordatus; the remaining, a minority of 9 plants, have 14 to 22 heads and conform roughly to the standard of S. pseudoaureus as expected for the area. Obviously, the number of heads per plant has no diagnostic value in the present case. Other criteria have proved to be equally unsatisfactory.

Alleged differences in root system are equally unconvincing, granted that the more western plants tend to have a somewhat thicker and more horizontal rhizome than the eastern plants.

The species is of discontinuous distribution across our area, being apparently restricted to southern Manitoba, the Cypress Hills and southwestern Alberta. We have seen three of the Saskatchewan collections cited by Breitung 1957 as S. pseudoaureus, but we place these in the radiate form of S. indecorus (or S. discoideus), a species not later recognized by Breitung. On the other hand another Cypress Hills collection, Breitung's 4513 (or "4313") falls within our concept of S. aureus. It was originally named and distributed as S. pseudoaureus, but cited by Breitung 1954 as S. indecorus, then in 1957 included in S. pauperculus var. thompsoniensis, finally in 1959 returned to S. pseudoaureus.

Some Alberta and B.C. specimens have oblong-lanceolate basal leaves and would probably have been identified as S. Robbinsii Oakes if they had been collected in the east.

S. aureus grades into the next species, but the two are largely allopatric and generally quite distinct. Typically S. aureus has † cordate basal leaves, radiate heads and the involucre is green, although frequently tipped in red, while S. indecorus has ovate basal leaves, discoid heads, and a purplish-tinged involucre. However, smaller plants of S. aureus in our area will quite often have ovate basal leaves, while on occasion these may be subcordate in S. indecorus. Exceptional individuals may be discoid in S. aureus while the radiate form of S. in-

decorus is not infrequent. And exceptional specimens of S. indecorus may have a green involucre. On the basis of the distributional patterns of the typical specimens and of field associations, we judge that specimens that are morphologically intermediate are more likely to relate to S. aureus if the head is discoid and the involucre green, but to S. indecorus if the head is radiate and the involucre purple-tinged. The latter also runs to higher heads. In practice the purplish condition of the involucre is a more reliable characteristic of S. indecorus than its discoid presentation.

14. S. indecorus Greene (S. discoideus (Hooker) Britton) -- Mostly like a larger var. firmifolius and transitional to the next species. Generally a larger plant, usually 6-8 dm high. Leaves broadly lanceolate, mostly pinnatifid towards the base, the basal ones broadly oval, mostly 2-3 cm wide. Heads discoid. Tegules purplish. Involucre 7-10 mm high. Mid summer. Moist meadows. --(seK)-Mack-Aka, Q-BC, nUS--F. Burkei (Greenman) Fern. (S. pauciflorus Pursh f. fallax (Greenman) Boivin) -- Heads radiate, hence resembling a smaller S. aureus, but the involucre purplish and the ligules rather short, usually not over 5 mm. Occasional and sometimes nearly as common as the discoid form. --Mack-Y, O, S-BC.

Early reports of S. discoideus will be found to apply indifferently to this or the next species. The distinction in two taxa was introduced by Fernald, Rhodora 26: 116-122, 1924, but we disagree with his interpretation of the name S. discoideus. The type of S. discoideus was collected by Richardson at Fort Franklin on the Great Bear River and, working from a photograph, Fernald concluded that it was intermediate but best placed with S. pauciflorus on the basis of the leaf shape, although it resembled S. indecorus in its more numerous heads. Barkley 1962 accepted Fernald's disposal of S. discoideus, but Richardson's track, as mapped by Hooker 1840, lies outside the range S. pauciflorus, Raup's 1947 map as well as Barkley's finely dotted distribution maps show clearly that Hooker's type came from the northern edge of the area of S. indecorus and some 250 miles away from the nearest known occurrence of S. pauciflorus. We judge therefore that the type of S. discoideus cannot but belong with the polycephalous S. indecorus. Further Raup 1947 cited an apparent isotype (CAN) of S. discoideus under S. indecorus. Thus is justified our disposal of S. discoideus as a synonym of S. indecorus, while the more recent reports of S. discoideus should be interpreted mostly as S. pauciflorus.

As a binomial, S. discoideus first appeared in T. & G. 1843 in the discussion of the synonyms, hence was

not validly published at the time. Its valid publication by Britton 1898 is antedated by that of S. indecorus Greene 1897, hence the present choice of correct name.

15. S. pauciflorus Pursh (S. discoideus AA.) -- Involucre 6-8 mm high and nearly always more or less purplish, the ligules nearly always lacking. Mostly 1-4 dm high. Basal leaves less than 2 cm wide, \pm ovate, rounded to broadly cuneate at base. Heads few, mostly 3-5. Disk florets tending to red-orange. Mid summer. Arctic or alpine meadows. -- K-Aka, L-NF, Q-nMan, Alta-BC, US.

This and the last are quite closely related and their intraspecific variability is sufficiently wide that an interspecific hybrid would be difficult to detect and even more so to define. Two of Calder's collections from B.C. and Yukon were distributed as such a hybrid, but by their more numerous heads and higher involucre we judge them to be better placed with S. indecorus.

16. S. tridenticulatus Rydb. (S. densus Greene; S. manitobensis Greenman; S. plattensis AA.) -- Somewhat fleshy and the leaves all similar, all lobed to pinnatifid, and not more deeply so towards the base. Tufted, glabrous, about 2 dm high. First half of summer. Wind-eroded sands, very local. --swMan-(scS), cUS.

A collection from Stewart's lake Mountain, B.C. (CAN) was a syntype of S. manitobensis Greenman, Ott. Nat: 25: 117, 1911 and was mentioned again as S. tridenticulatus in Ann. Miss. Bot. Gard. 3: 180, 1916. The specimen was recently reexamined and revised to S. streptanthifolius.

17. S. resedifolius Less. (S. cymbalarioides Buek; S. subnudus DC.) -- Monocephalous perennial with at least some of the leaves deeply lobed to pinnatifid. Glabrous, 1-3 dm high. Basal leaves ovate, mostly dentate. Lower stem leaves deeply cut, the upper greatly reduced. Tegules green or purplish, glabrous. Ligules often lacking. Early to mid summer. Alpine boggy meadows and shale slides. --wF, wMack--Aka, (NF, seQ), swAlta-BC, (nwUS, eEur).

Further west, there is an endemic variant in the Queen Charlotte Islands: var. moresbiensis (Calder & Taylor) stat. n., S. cymbalarioides Nutt. ssp. moresbiensis Calder & Taylor, Can. Journ. Bot. 43: 1399. 1965, somewhat more pubescent, the involucre being slightly lanate at base, and the rosette leaves more uniformly crenate or serrate right to the base. It was by mistake that in 1967 this variety was listed under S. streptanthifolius.

49. CALENDULA L.

POT MARIGOLD

Achenes all peripheral, strongly curved and either

winged on either side or strongly rugose or acicular dorsally. Heads radiate, the ligulate flowers fertile, the tubular ones sterile and long stipitate, the stipe not dehiscent. No chaff, no pappus.

1. *C. ARVENSIS* L. -- Gools (Souci des champs, Fleur de tous les mois) -- Head fairly large and radiate, like an Aster, but yellow and the rather unusual achenes borne only at the periphery. Herbage strongly glandular. Tegules isomegueth, abruptly caudate. Summer and fall. Rare and fleeting escape from cultivation: Brandon.--NB, Man, BC, swUS, Eur.

50. ECHINOPS L.

GLOBE-THISTLE

Head compound, made up of a large number of primary heads, each one reduced to a single floret and its involucre.

- a. Stem tomentose, the tomentum becoming white and compact in the upper part 1. *E. exaltatus*
 aa. Tomentum mixed with numerous long, coloured and glandular hairs 2. *E. sphaerocephalus*

1. *E. EXALTATUS* Schrader -- Rather closely similar to the next. Little if at all glandular. Leaves larger and more narrowly cut, the lobes ± lanceolate. Tegules glabrous on back. Second half of summer. Persisting after cultivation in a city garden at Swift Current. -- swQ-O, swS, swBC, Eur.

2. *E. SPHAEROCEPHALUS* L. -- Globe-Thistle (Boulette, Chardon-boulette) -- Head globular with the receptacle at the centre of the sphere. Leaf resembling Cirsium by its cutting and its excurrently spinescent nerves. Heads few, 3-6 cm across, bluish, spinescent, borne on long peduncles. Tegules puberulent dorsally. Mid summer. Sometimes cultivated and rarely spreading to waste places: Otterburne. -- swQ-seMan, BC, (US), Eur.

Reported from Regina and Saskatoon by Bussell 1937, 1944, 1954 and Breitung 1957. We have not been able to tie these reports clearly to any herbarium specimen. Of the two possible sheets located, Dr. G.W. Argus commented (in litt., 1964) on the first one (SASK) "there is no locality or date on this specimen and it seems unjustified to assume that it is of Saskatchewan origin". The other sheet came from Landis (SASKP) and we have revised it to *Eryngium planum*.

51. ARCTIUM L.

BURDOCK

Fruits very catchy as follows: the tegules are attenuate to a fine, hooked point, they are also fused at base and divergent at tip to form a globular unit which becomes very readily detached from its peduncle.

- a. Inflorescence broadly corymbiform, the lower heads on long peduncles.
 - b. Involucre glabrous, 3 cm wide or more
..... 1. A. Lappa
 - bb. Narrower and densely tangled with an arachnoid tomentum 2. A. tomentosum
- aa. Inflorescence a broad panicle of racemes of small clusters; lower heads on peduncles usually short, rarely over 3 cm long.
 - c. Involucre glabrous or glandular 4. A. minus
 - cc. Tegule tips more or less tangled with an arachnoid tomentum 3. A. nemorosum

1. A. LAPPA L. -- Great Burdock, Cukle-Buttons (Grande Bardane, Glouteron) -- Heads largest, 3-4 cm wide, hemispheric and glabrous, forming one or more broad corymbs. Tegules green with ivory tips. Otherwise similar to A. minus. Second half of summer. Waste places and footpaths, a rare weed with us. -- (NS), NB-Man, BC, US, Eur.

2. A. TOMENTOSUM Miller -- Also similar to A. minus, but the inflorescence \pm corymbose and each head is wrapped in a loose cocoon of arachnoid tomentum anchored near the tips of the tegules. Heads subglobose, 2-3 cm wide. Second half of summer. Roadsides and footpaths. --NS, NB-Alta, (US), Eur.

3. A. NEMOROSUM Lej. & Court. -- Heads tangled with an arachnoid tomentum and often larger, up to 3.5 cm wide, and broadly globular, i.e. slightly broader than high. Otherwise pretty much like the next and perhaps not specifically distinct from it. Mid summer. Waste places and footpaths; rare. -- NF, NS, (NB)-Q-Man, Alta-BC, US, Eur.

We have checked specimens from Otterburne (MSM), Saint-Pierre-Jolys (DAO), and Edmonton (DAO).

4. A. MINUS (Hill) Bernh. -- Burdock (Bardane) -- Coarse herb with very catchy fruits which readily become detached from their peduncle to attach themselves firmly to the clothing of the passerby. Basal rosette similar to Rhubarb, but the leaves somewhat smaller, ovate, arachnoid below. Heads 2-3 cm wide, glabrous to glandular, globular-ovoid. Tegules at first green with ivory tips, becoming purplish at maturity. Second half of summer. Waste places and footpaths; infrequent. -- NF, NS-BC, US, Eur.

Some conspicuous foliar anomalies may be found. They are apparently related to tramping or herbicide action.

52. SAUSSUREA DC.

Heads discoid. Pappus long and plumose. Leaves

alternate and not spiny.

- a. Tegules acuminate at tip, isomegueth..... 1. S. nuda
 aa. Dilated at tip into a suborbicular and
 petaloid segment 2. S. glomerata

1. S. nuda Led. var. densa (Hooker) Hultén -- Short perennial with a small terminal corymb of large discoid heads. Usually less than 2 dm high. Leaves many, crowded, lanceolate, + dentate, somewhat arachnoid, especially along the margin. Heads 1.5-2.0 cm high. Tegules usually dark purple. Mid summer. High alpine on rocky slopes. --swAlta-sBC.

The typical phase is alaskan and eurasian; its stem leaves are rapidly smaller above, those from the upper half entire and narrowly linear or nearly filiform; its inflorescence overtops the foliage. In our var. densa the upper leaves are much less reduced, being at least half as large and half as long as the lower ones; and the inflorescence is + overtopped by the upper leaves.

2. S. GLOMERATA Poirét -- Inner tegules with a petaloid terminal segment, 1-2 mm wide, pink, + fimbriate at margin. Stoloniferous perennial up to 4 dm high. Leaves entire, densely glandular-punctate in yellow-brown below. Outer tegules many times shorter than the inner. Late summer. Rare farmyard weed: Debolt near Grande-Prairie. --wcAlta, Eur.

53. CARDUUS L.

PLUMELESS THISTLE

Resembling Cirsium, the leaves similarly spiny. However the pappus is not plumose, but merely short-barbellate.

1. C. NUTANS L. var. VESTITUS (Hal.) Boivin (var. Petrovicii Arènes, ssp. leiophyllus (Petrovic) Arènes; C. Thoermeri Weinm.) -- Musk-Thistle, Nodding Thistle (Cardinal, Chardon aux ânes) -- Large and ferociously spiny herb, usually monocephalous, the head very large. Stem 1-3 m high, spiny from decurrent wings. Leaves spiny and cut in the manner of a Cirsium, glabrous dorsally. Head purple, discoid, 4.0-5.5 cm wide. Tegules large, spiny tipped, becoming reflexed. Lateral heads, if present, smaller, Mid summer. Obnoxious weed of roadsides and pastures, still local but spreading. -- Q-S, BC, US, Eur.

Another variety also occurs west of us at Alexis Creek in B.C.; var. macrocephalus (Desf.) stat. n., C. macrocephalus Desf., Fl. Atl. 2: 245. 1798-1800, heads larger, 5-6 cm wide; leaves somewhat arachnoid-pubescent dorsally.

The shape and coloration of the tegules vary and specimens in which the upper and more colourful half is

broader than the lower pale green half have been distinguished as var. macrolepis (Peterm.) Rouy (= C. Thoermeri). This phenotype has been recognized in our area, but its significance, if any, eludes us.

54. CIRSIUM Miller

THISTLE

Very spiny from the leaf-nerves long-excurrent into needlelike points. Heads large, discoid. Pappus plumose.

- a. Leaves decurrent with spiny wings from node to node and up to the base of the heads..... 1. C. vulgare
- aa. Leaves not decurrent, or at least not in the upper half of the plant.
 - b. Inner tegules ending in a twisted scarious appendage, the outer tegules spine-tipped.. 6. C. Drummondii
 - bb. All tegules sharp-pointed, or spinetipped; heads smaller.
 - c. Involucre 1.0-1.5 cm high 9. C. arvense
 - cc. Heads larger.
 - d. Heads overtopped by the uppermost or subtending leaves.
 - e. Tegules straight, their tips appressed; herbage very long-villous 7. C. foliosum
 - ee. Tegules squarrose, ending in spines directed outward; herbage thinly arachnoid-tomentose 8. C. Hookerianum
 - dd. Heads overtopping the foliage.
 - f. Stem white-tomentose.
 - g. Leaves \pm flat, the lobes lanceolate and narrower than the sinuses..2. C. Flodmanii
 - gg. Leaves strongly crisped, the lobes \pm deltoid and \pm overlapping ... 3. C. undulatum
 - ff. Stem green, not tomentose.
 - h. Tegules ending in a deflexed spine; leaves white-tomentose below.. 4. C. altissimum
 - hh. Tegules merely sharp pointed; leaves only paler green below 5. C. muticum

1. C. VULGARE (Savi) Tenore (C. lanceolatum AA.) -- Bull-Thistle, Scotch Thistle (Gros chaudron, Piqueux) -- Herbage spiny throughout, even the upper leaf surfaces

acicular-hispid. Biennial, mostly about 1 m high and unapproachable. Leaves \pm arachnoid below. Heads tending to be overtopped by the upper leaves. Florets purple. Mid to late summer. Rare weed, usually near ditches or creeks. --NF-(SPM), NS-BC, (US, Eur).

The range was extended to Alaska by Hultén 1950 and Anderson 1952, but the main justifying specimen, Anderson 5573, Hyder, 1939 (S) turned out to be a sterile shoot of C. arvense (L.) Scop. Reports from Sitka and Salmon River Glacier have not been investigated.

2. C. Flodmanii (Rydb.) Arthur (C. oblancoelatum Rydb.; C. plattense AA.) -- Long-stoloniferous perennial with the rosette-leaves polymorphic, some of them unlobed and merely spinulose-margined. Stem and lower leaf surfaces covered by a thin and compact tomentum. Upper leaves smaller and less deeply lobed, often unlobed even. Involucre narrowly campanulate, 2.0-2.5 cm high, 1-2 cm wide at base in the herbarium. Florets pinkish. Seeds 3.5-5.0 mm long. Mid summer. Common in prairies. --swQ-Alta, US -- F. albiflorum D. Löve -- Florets white or cream-coloured. -- Man-Alta, US.

Rather variable and herbarium specimens seem to be readily confused with the next. In the field the difference is quite striking. The few rosette-leaves of C. Flodmanii are in part flat and unlobed. The heavily crisped leaves of C. undulatum are all equally lobed and gathered into dense rosettes. Both species may seem to be biennial, but some patient digging (or a handy road cut) will reveal deeply buried and rather extensive root-connections.

3. C. undulatum (Nutt.) Sprengel var. undulatum (var. megacephalum (Gray) Fern.; C. Engelmannii AA.) -- Woolly Thistle -- Much like the last and not so obviously stoloniferous, but all the leaves cut alike and all strongly contorted in the sinuses. Upper leaves are gradually smaller. Heads larger, campanulate to hemispheric, 2.5-3.0 cm high and 2.0-3.5 cm wide at base in the herbarium. Florets purplish-red. Seeds 5-7 mm long. Summer. Drier prairies and steppes, from Dalny westward. --swMan-BC, US -- F. album Farw. (C. brevifolium AA.) -- Heads white; Milden, Maple creek. --swS, US.

Often mentioned for Manitoba but all collections examined appear to have been misidentified except the following: Boivin 13434, rivière Souris à l'ouest de Dalny, écorce de la coulée, 3 juin 1960 (DAO).

A more western var. Franktonis Boivin has pink flowers and smallish heads as in C. Flodmanii, but the seeds are larger as in C. undulatum. The technical justification: C. undulatum var. Franktonis var. n., capitulis modo minoribus; involucre 2.0-2.5 cm alt.; corolla rosea, post

anthesim albescens; sed semina \pm 6 mm long. et ceteris praecipue ad C. undulatum vergens, attamen foliis saepius minus crispatis. Typus: Calder & Savile 9838, at foot of Mt. Anarchist, just east of Osoyoos, common in open sagebrush slopes above lake; June 29, 1953 (DAO). Paratypi omnes ex DAO: Calder & Savile 10397, Spences Bridge; J.W. Eastham 15914, Fairmont Hot Springs; Bea-mish, Vrugtman & Kallio 9183, Copper Rd. Mt.; J. Fletcher, Kelowna; V.C. Brink 40-811, Kamloops; Calder & Savile 11353, Fairmont Hot Springs; W.H. Brittain, Vernon; Mulligan & Woodbury 1988, Vernon; Senn, Frankton & Gillett, Cascade; Mulligan & Woodbury 1796, Lilloet; Mulligan & Woodbury 1931, Pentiction; Calder, Parmelee & Taylor 19115, Williams Lake.

Named after Dr. C. Frankton, a long time student of the genus.

4. C. altissimum (L.) Sprengel var. discolor (Muhl.) Fern. (C. discolor (Muhl.) Sprengel) -- Leaf surfaces strongly contrasted: white-tomentose below, dark green and lightly villous above. A rather middling species with pinnatitid to nearly pectinatipartite leaves, strongly scabrous above. Stem green, mostly 1-2 m high, with very large basal leaves. Late summer. Wet meadows and marshy shores: Emerson, --swQ-scMan, US.

The Emerson (DAO) collection is the only one seen. Old reports for our area of Cnicus altissimus var. discolor and of Cirsium altissimum should probably not be interpreted in the sense of the above var. discolor. Dawson's 1875 report for the Rockies undoubtedly meant something else. And his Turtle Mountain report is probably based on C. Flodmanii, if we are to judge from a Burgess collection (TRT) made 5 days later. The Winnipeg report by Macoun 1897 was based on a sheet that either did not survive or else has been revised since to something else, possibly C. Flodmanii.

In the typical and more southern var. altissimum the leaves are less deeply cut, being merely serrate to lobed. The two varieties are reported to be completely intergradient in their area of sympaty, but all the Canadian material examined was clearly referable to var. discolor.

5. C. muticum Mx. -- Dunce-Nettle, Horsetops -- Tegules not ending in a squarrose spine, but the middle and outer ones merely mucronate while the inner ones are attenuate into petaloid and scarious tips. Main leaves pinnatipartite, arachnoid below, weakly acicular-ciliate. Heads purplish. Tegules arachnoid. Mid to late summer. Marshy or boggy places. --L-NF-(SPM), NS-cS, US -- F. lactiflorum Fern. -- Flowers white. Wallwort. -- NF, Q, S.

6. C. Drummondii T. & G. (C. foliosum AA.; C. Hillii AA.) -- Head largest, 5-8 cm across and typically so-

litary, its involucre \pm 4 cm high. Stem low, thick, fistulous, easily crushed, sometimes lacking, often short, always very leafy and the leaves rather long, the upper overtopping the inflorescence. Herbage long villous. Heads sometimes more than one, then 3-5 in a terminal cluster, the lateral heads smaller. Shortly before mid summer. Chernozema at forest margin; infrequent. -- sMack, wO-eBC, ncUS.

7. C. foliosum (Hooker) DC. var. foliosum -- Somewhat like the last, but the heads not quite so large and the corollas whitish. Herbage also quite similar to the last and similarly long villous. Leaves very numerous and the upper much overtopping the inflorescence. Heads always many in a crowded terminal cluster. Involucre 2.0-2.5 cm high, the tegules all spine-tipped. Pappus pale brown or grayish and conspicuous, overtopping the corollas. Mid summer. Mountain meadows, down to lowland meadows northward. --sMack-(sY), sAlta-BC, US.

Leaves mostly green and pilose below, or sometimes \pm white-tomentose. Tegules all appressed. Further east there is a highly isolated var. minganense (Vict.) stat. n., C. minganense Vict., Mém. Soc. Roy. Can. 19: 81. 1925, which has the pappus only as long or slightly shorter than the pink corollas. Also the rosette leaves are white-tomentose below; stem leaves variable, mostly pilose below; inner tegules squarrose, twisted and slightly dilated towards the tip. Known only from the shores of some of the Mingan Islands in the Gulf of Saint-Lawrence.

Var. minganense has also been treated as an outright synonym of C. scariosum in Can. Journ. Bot. 45: 1742. 1967, although it presents itself more like a variety intermediate between C. foliosum and C. Hookerianum. It is quite close to C. foliosum because of its habit, its denser inflorescence and its grayish pappus. It shown some affinity to C. Hookerianum in its tomentose pubescence, its short pappus, its squarrose inner tegules and somewhat larger seeds.

8. C. Hookerianum Nutt. var. Hookerianum - Heads also whitish like the last but the pappus not so conspicuous, being overtopped by the corollas. Pubescence more tomentose and at least the lower leaves white-tomentose below. Inflorescence very variable, corymbose or paniculate to monocephalous, typically racemosely paniculate with a terminal cluster of \pm 3 subsessile heads and many axillary clusters of 1-3 heads on short peduncles. Tegules glandular and the middle ones somewhat villous and long ciliate, the outer and middle ones arachnoid-tomentose. Pappus white and shorter. Summer. Shale slides and alpine or subalpine meadows. --swAlta-BC, US -- Var.

scariosum (Nutt.) Boivin (C. scariosum Nutt.) - Tegules not squarrose, except the inner, and less pubescent, merely glandular or the outer somewhat arachnoid-tomentose. From the Crowsnest southward. --swAlta, nwUS.

Var. scariosum (Nutt.) stat. n., C. scariosum Nutt., Trans. Am. Phil. Soc. 7: 420. 1841.

9. C. ARVENSE (L.) Scop. (var. integrifolium Wimm. & Grab., var. mite Wimm. & Grab., var. vestitum Wimm. & Grab.) -- Canada Thistle (Chadron, Chaudron) -- Heads smallest. About 1 m high and growing in dense colonies. Heads at first few and corymbose, becoming many and narrowly paniculate. Inner tegules not spiny, the outer very short spiny. Florets purplish. Mid to late summer. Common and invading weed. -- G, Mack, Aka, NF-SPM, NS-BC, US, Eur, (Afr) -- F. ALBIFLORUM (Rand & Redf.) R. Hoffm. -- Heads white-flowered -- NF, NS-BC, US, Eur.

54. SILYBUM Adanson

MILK-THISTLE

Resembles Cirsium but the pappus bristles are not plumose, not even barbellate, and the tegules are constricted towards the middle to delimitate two segments, the upper spiny-tipped as in Cirsium, the lower acicular-ciliate.

1. S. MARIANUM (L.) Gaertner -- Milk-Thistle, Lady's Thistle (Chardon-Marie) -- Like a huge Cirsium and the leaf nerves, except the midnerve, outlined by a broad white strip. Foliage spiny in the Cirsium manner, but huge, the lower leaves 5-10 dm long. Heads very large, the terminal 5-8 cm wide. Mid summer. Rare and fleeting weed of cultivated ground, sometimes seeded in as an ornamental. --NS, NB-O, S, BC, US, SA, Eur.

56. CENTAUREA L.

STAR-THISTLE

Tegules, at least the inner ones, more or less clearly differentiated into a lower and an upper segment in the manner of the last genus. Terminal segment palmately lobed or fimbriate, the fimbriae sometimes spinescent. Herbage otherwise not spiny. Pappus variable, chafy or bristly or none. This genus not readily defined except that the achenes are attached obliquely to the receptacle.

- a. Involucre long-spiny 2. C. solstitialis
 aa. Not spiny, sometimes with short acicules.
 b. Leaves pinnatipartite to bipinnatipartite;
 flowers yellow 1. C. diffusa
 bb. Entire to dentate; flowers pink or blue.
 c. Florets blue, the peripheral ones
 much enlarged 3. C. Cyanus
 cc. Pink and all alike 4. C. repens

1. *C. DIFFUSA* Lam. -- Tip of tegule pectinate, the lobes very stiff, the central one 2-3 times longer and almost acicular. Biennial, often tufted, very scabrous. Leaf segments 1-2 mm wide. Heads narrow, the involucre about 1 cm high. Corollas sometimes fading pink. Mid summer. A railway weed at Grassy Lake. --sAlta-BC, US, Eur.

2. *C. SOLSTITIALIS* L. -- Barnaby's Thistle, Yellow Star-Thistle (Chardon doré, Auriole) -- Non spiny herb except for the heads ferociously armed with yellow spines. Herbage tomentose. Stem winged from the decurrence of the linear leaves. Spines widely divergent, the main ones longer than the body of the head. Florets yellow. Late summer and fall. Rare garden weed: Shellmouth, Ogema, Scott. --sO-S, US, (Eur).

3. *C. CYANUS* L. -- Cornflower, Bluebottle (Bleuet, Barbeau) -- Peripheral florets much longer and much larger than the inner ones, simulating a blue head radiate in blue. Narrow-leaved annual. Middle and inner tegules narrowly lobed at tip. Summer and fall. Casually reseeding itself along roadsides and waste places after cultivation. --NF, NS-Man, Alta-BC, US, Eur.

4. *C. REPENS* L. (C. Picris Pallas) -- Russian Knapweed, Turkestan-Thistle -- Tegules ciliate at tip, the inner ones abruptly contracted into a long, plumose bristle. Perennial from long and deeply buried stolons. Main leaves dentate, the others entire and much smaller. Heads pink, few, in a corymbose inflorescence at the end of long and leafy branches. Mid summer to early fall. Uncommon weed of fields. --O-BC, US, Eur.

57. CICHORIUM L.

SUCCORY

Florets all ligulate, but the pappus not plumose, a mere ring of small scales. Flowers blue.

a. Heads all or mostly longer than their bracts ..

..... 1. C. Intybus

aa. Bracts much longer 2. C. Endivia

1. *C. INTYBUS* L. -- Chicory, Blue Sailors (Chicorée, Chicorée sauvage) -- A branchy and nearly squeletic perennial with large, blue, ligulate flowers. Milky juice white. Rosette leaves large, † runcinate, the cauline ones few and much reduced. Flowers in small, distant glomerules with bracts mostly under 1 cm long. Outer tegules reflexed, at least after flowering. Pappus minute. Mid to late summer. Casual weed of roadsides, waste places and neglected gardens. -- L-SPM, NS-BC, US, SA, Eur.

2. *C. ENDIVIA* L. -- Endive (Chicorée endive) -- Similar but the inflorescence more leafy, the glomerules being

subtented by triangular bracts mostly 2-5 cm long. Pappus up to 1/2 as long as the seed. Mid summer. Rare escape: Kinistino, Lethbridge --S-Alta, Eur.

58. LAPSANA L.

NIPPLEWORT

Like the last, but the flowers pale yellow and the pappus lacking or vestigial.

1. *L. COMMUNIS* L. -- Nipplewort, Swine's Cress (Herbe aux mamelles, Saune blanche) -- Tegules dimegueth, the inner about 8 in number and 5-6 mm long, the outer about 5 and \pm 1 mm long. Herbage hirsute. Upper leaves lanceolate and sessile, the middle ones ovate with a narrowly winged petiole, the lower ones lyrate-pinnatipartite. Heads small in an open inflorescence. Mid summer to fall. A rare weed of shaded places, reported from Winnipeg. -- G, Aka, NF, NB-O-(Man), BC, US, Eur.

59. MICROSERIS D. Don

Scapose or nearly so and generally resembling Agoseris, but the pappus subsessile. One species is atypical, the achenes being tapered at tip.

- a. Leaves all basal; tegules isomegueth 2. *M. cuspidata*
 aa. At least one stem-leaf; tegules strongly dimegueth 1. *M. nutans*

1. *M. nutans* (Meyer) Schultz-Bip. -- Herbage somewhat farinose-puberulent with small vesicular hairs resembling those of Chenopodium. Habit of Crepis, but the stem leaf (or leaves) borne towards the base. Stem often becoming branchy. Leaves eciliate, long-linear and entire or more commonly pinnatipartite, the lobes few, narrow and remote. Involucre 1-2 cm high, the inner tegules at least twice as long as the outer. First half of summer. Open slopes in the mountains: Waterton. --swAlta-BC, wUS.

2. *M. cuspidata* (Pursh) Schultz-Bip. -- (Agoseris cuspidata (Pursh) Raf.; Nothocalais cuspidata (Pursh) Greene) -- Leaves tomentose-ciliate. Peduncle \pm tomentose towards the summit. Pretty similar to Agoseris but the latter flowers later and its leaves are eciliate. Mid spring. Steppes on hillsides. --swMan-sS-sAlta, US.

Rather uncommon, and often confused with Agoseris, the latter eciliate. Most early reports are to be taken with a grain of salt. We know of only one Alberta sheet, a Dawson collection from the Milk River (CAN), but we have checked 5 or 6 from Saskatchewan. For Manitoba we have checked collections from south of Minto (CAN) and Brandon (DAO). An early report from Fort Ellice (MTMG) by Macoun 1884 was more recently listed as Agoseris agrestis by Scoggan 1957; it has since been revised to A. glauca. A report from Kleefeld by Løve 1959 has not

been checked.

60. KRIGIA Schreber

DWARF DANDELION

The pappus appendages dimorphic, the 5 outer ones being very short, hyaline and inconspicuous scales, while the numerous inner ones are capillary bristles. Achene beakless.

1. K. biflora (Walter) Blake (K. amplexicaulis Nutt.) -- Cynthia, False Dandelion -- Subscapose perennial, the leaves mostly basal, but with 1 stem leaf or at least with 1-3 bracts subtending the forks. Herbage glabrous or the peduncles glandular. Leaves resembling Agoseris. Heads few, yellow, the upper 3 on subequal peduncles. Tegules about 10, isomegueth, 7-10 mm long. Late spring. Open sandy woods, rare: Teulon and region. --swO-Man, US.

61. HYPOCHAERIS L.

CAT'S EAR

Receptacle chaffy. Pappus of plumose bristles at the end of a thin long beak. Tegules strongly imbricated.

1. H. RADICATA L. -- Cat's Ear, Fall-Dandelion, (Salade de porc, Herbe à l'épervier) -- Stems and branches bearing many very small bracts; the leaves all basal and very coarsely hirsute. Resembles Crepis runcinata, but the latter has a sessile pappus and nearly glabrous leaves, or at least less pubescent than the inflorescence. Peduncles very long, glabrous, slightly thickened upwards. Tegules dark green with a pale green midnerve which becomes purplish and thickened or barbed towards the tip. Outermost tegules very small and forming an ill-defined calycul. Ligules yellow, but the outer ones green dorsally. Late summer and early fall. Rare garden weed: Scott. --(Aka, NF)-SPM, NS, NB-O, S, BC, US, SA, Eur.

62. PICRIS L.

Leafy-stemmed herb with a pappus of plumose bristles borne at the end of a very long beak. Tegules dimegueth or dimorphic.

1. P. ECHIOIDES L. var. ECHIOIDES -- Ox-Tongue (Langue de boeuf) -- Outer tegules rather large, triangular-cordate and acicular-hispid, especially acicular-ciliate. Herbage acicular-hispid throughout, almost like some Borage. Stem leaves alternate, becoming subopposite or subverticillate in the inflorescence. Outer tegules 5-8 mm wide and 1-2 cm long, the inner narrower and lanceolate. Late summer and fall. Rare weed of waste places: Prince Albert, Grande-Prairie. --(NS), NB, O, S-Alta, US, SA, Eur.

Ours is the typical plant with an involucre \pm 1 cm high and dimorphic pubescence, the longer and black hairs being \pm 1 mm long. The beringian var. kamtschatica (Led.) stat. n., P. kamtschatica Led., Mem. Ac. Imp. Sc. St. Pet. 5: 557. 1815 is a generally coarser plant, the coarse black hairs \pm 2 mm long, and the involucre 12-14 mm high.

63. STEPHANOMERIA Nutt.

Pappus bristles plumose, otherwise quite similar to Lygodesmia and perhaps better united with it. Barbs of the pappus 0.5-1.0 mm long.

1. S. runcinata Nutt. (S. tenuifolia AA.) -- Much like the common Lygodesmia juncea, but a bit more leafy and the main stem leaves runcinate-pinnatifid. Pappus pure white. Early to mid summer. Rolling steppes and badlands, rare. --swS-swAlta, nwUS.

S. tenuifolia (Torrey) Hall occurs in Canada only in British Columbia. Its leaves are filiform and entire or merely denticulate. All specimens so named from our area turned out to have the broader and more deeply cut leaves of S. runcinata.

S. minor (Hooker) Nutt. was also reported by Dawson 1875 and Macoun 1884, but the justifying collection from south of Wood Mountain (DAO, TRT) has since been revised to S. runcinata. See the Blue Jay 23: 41-42, March 1965.

64. TRAGOPOGON L.

GOAT'S BEARD

Barbs of the pappus bristles very long and crinky, becoming entangled at tip with the barbs of the next bristle. Seed rather large, long beaked, its bristles spreading horizontally into a conspicuous little parachute.

a. Flowers purplish red 1. T. porrifolius
aa. Yellow; seeds with shorter beak.

b. Peduncle gradually thickened upward,
becoming about twice thicker near the
summit 2. T. dubius

bb. Peduncle of uniform thickness... 3. T. pratensis

1. T. PORRIFOLIUS L. -- Salsify, Oyster-Plant (Salsifis) -- Largely similar to the next two. Ligules purplish red, drying dark purple blue. Heads larger, up to 8 cm in flower or fruit. Peduncle \pm enlarge upwardly. Involucre 3.5-5.5 cm high, at least in fruit. Seed 2.5-4.0 cm long, excluding the pappus, but including the beak which is longer than the body. Pappus very light brown, nearly concolourous with the achene. Late spring to mid summer. Rare weed of rights of way. --(NS), Q-Man, Alta-BC, US, (Eur).

2. *T. DUBIUS* Scop. (*T. major* Jacq.) -- Flowers yellow like the next, but the peduncle gradually enlarged upward to 4-8 mm across. Leaves not so strongly falcate. Involucre 3-6 cm high. Seed 2.5-3.5 cm long, the beak shorter than the body. Pappus whitish, lightly tinted gray. Summer. Frequent weed, even invading native prairies in places. --Mack, NS, Q-BC, US, (Eur).

3. *T. PRATENSIS* L. -- Goat's Beard, Jack-Go-to-Bed-at-Noon (*Salsifis blanc*, *Barbe de bouc*) -- Leaves longest, attenuate; tegules relatively longest; parachute-seed largest. Leaves grass-like, falcate-recurved, the long attenuate tip longer than the \pm lanceolate base. Peduncle elongate, about 2 mm thick. Involucre 2-4 cm high, at least equalling the florets. Fruiting heads \pm 5 cm wide. Achene 1.5-2.5 cm long, the beak shorter than the body. Summer. Rare weed of disturbed soils: North Kildonan, Calgary. --NS-Man, Alta-BC, US, Eur.

65. *TARAXACUM* L.

Scapose herb with a rosette of runcinate leaves and a globose head of umbrella-like seeds. Ribs of the seed covered towards the summit with short acicules. Pappus bristles minutely scabrous.

Both in Europe and in America, the species concept in this genus has been miniaturized. About 1000 microspecies were described and named during the 1940-65 period alone. In our 1962 survey of literature and major herbaria, we found the *Taraxaca* of Canada, Greenland and Alaska filed under 112 different specific names. No overall treatment exists for our area and none seems forthcoming. The effective recognition of these finer segregates is practically restricted to a few skilled botanists with access to the specialized literature of the genus and a good collection for comparison. We have found the recognition of the segregates to be a very fascinating and sometimes frustrating herbarium exercise. But the intellectual import of the exercise has eluded us.

As far as our experience goes, three names will account satisfactorily for the variation to be encountered in our area, all the native plants being versed into *T. ceratophorum*.

- a. Tegules ascending or appressed3. *T. ceratophorum*
 aa. The outer ones strongly squarrose and reflexed.
 b. Achene stramineous to brown; leaves more shallowly lobed upward 1. *T. officinale*
 bb. Achene becoming reddish brown at maturity; leaves uniformly and more deeply lobed ..
 2. *T. laevigatum*

1. *T. OFFICINALE* Weber -- Dandelion, Faceclock (Pissenlit) -- Seeds umbrella-like in a globose head. Scapose perennial with abundant milky juice, a rosette of runcinate leaves and monocephalous scapes. Leaves more deeply and more narrowly lobed towards the base, the upper lobes shorter and broader, the terminal one by far the largest. Beak 0.8-1.5 cm long. Mid spring to frost, mainly late spring. Common weed of lawns and tramped or grassy places. --Mack, L-NF, NS-BC, (US, Eur).

2. *T. LAEVIGATUM* (W.) DC. (*T. erythrospermum* Andrz.) -- Seed red brown, the base of the beak also red brown. Resembles the above species. Leaves pinnatifid to pinnatipartite, the lobes rather narrow and fairly uniform in size, the terminal one not particularly larger. Beak 0.4-1.0 cm long. Second half of spring. Infrequent weed of shaded or tramped places. --Mack, NS, NB-BC, (US, Eur).

3. *T. ceratophorum* (Led.) DC. (*T. dumetorum* Greene; *T. eriophorum* Rydb.; *T. lacerum* Greene; *T. lapponicum* Kihlm.; *T. lyratum* (Led.) DC.) -- Like the above two but the tegules neither squarrose nor reflexed. Leaves variable. Tegule tip varying from flat and acute to irregularly shaped or verrucose or bullate or corniculate. Early to mid summer. Native in semi-open ground of open places. --(G)-F-K, (Aka), L-(NF), Q-BC.

66. SONCHUS L.

Achenes strongly flattened. Pappus sessile, of smooth capillary bristles. Stem leafy, the leaves auriculate-clasping, acicular-toothed.

- a. Terminal leaf lobe deltoid; auricles triangular, acute 2. *S. oleracea*
- aa. Terminal lobe ovate to lanceolate; auricles broadly rounded.
 - b. Perennial; leaves mostly borne near the base of the stem 1. *S. arvensis*
 - bb. Annual; stem fairly uniformly leafy
..... 3. *S. asper*

1. *S. ARVENSIS* L. var. *ARVENSIS* -- Sow-Thistle (Chaudron-jaune, Crève-z-yeux) -- A coarse herb with spinulose-margined leaves and yellow heads 3-5 cm wide in flower. Perennial from deeply buried rhizomes. Leaves mostly borne near the base of the stem, runcinate-lobed, the middle and upper unlobed, much smaller and much more remote. Inflorescence glandular hispid. Involucre 1.5 cm high or more. Summer. Common weed of cultivated ground and wettish places. --Aka, NF-SPM, NS-BC (US, Eur) -- Var. *GLABRESCENS* C., G. & W. (*S. uliginosus* Bieb.) -- Inflorescence glabrous or at least not glandular, but only

finely tomentose in places. --Mack, NS-BC, (US, Eur).

Despite a difference in chromosome number (54 for arvensis and 36 for glabrescens) our two variants fall short of the minimum morphological differentiation to justify specific rank. The intervarietal hybrid, named X var. Shumovichii Boivin, has been found in Ontario and is likely to turn up in our area; it has intermediate vestiture and chromosome count, it backcrosses readily with the parental types to produce a sliding scale of chromosome counts and pubescence density.

2. S. OLERACEUS L. --Milk-Thistle (Chardon blanc, Laiteron) -- Terminal leaf lobe deltoid, about as wide as long. Stem about evenly leafy, the middle leaves often largest, mostly pinnatifid, the margin not quite so sharply acicular as the first, the basal auricles narrowed to acute tips. Annual. Involucre about 1 cm high. Achenes finely rugulose, the rugosities in transverse rows and about as obvious as the weak longitudinal nerves. Mid summer to early fall. A weed, mainly of backyards, waste places and gardens. --Mack, (Aka), NF-SPM, NS-BC, US, Eur.

There are many reports for Saskatchewan, but their basis remains largely obscure. A Saskatoon (SASK) collection in 1917 originally identified as S. arvensis var. glabrescens proved to be our first definite sheet of S. oleraceus for the province. Also reported as a greenhouse weed at Regina. The Langham report (SASKP) has been revised to S. asper. Other reports could not be substantiated, but a recent collection by Hudson at Saskatoon (DAO) is confirmed herewith.

3. S. ASPER (L.) Hill -- (Chaudronet) -- Resembles S. arvensis, but annual and the involucre only 1.0-1.4 cm high. Leaves more evenly spaced, although the upper are smaller and the internodes longer. Auricles strongly recurved, almost spirally coiled. Achene with 3 nerves on each side, otherwise smooth or nearly so. Mid summer to early fall. Weed of waste places and beaches. --Y-Aka, L-(NF)-SPM, NS-BC, US, Eur.

67. LACTUCA L.

LETTUCE

Differs from Sonchus by the beak (or top) of the achene being dilated into a disk on which the pappus is borne. Habitally quite similar to Sonchus.

a. Perennial with large blue heads 5. L. tatarica
aa. Annual or biennial with narrow heads.

b. Leaves acicular dorsally along the midnerve.

c. Involucre 10-13 mm high 1. L. Serriola

cc. Larger, 17-23 mm high 4. L. ludoviciana

bb. Midnerve smooth.

d. Pappus dirty gray to brown..... 7. L. biennis
dd. White.

e. Leaves, and especially the bracts,
broadly cordate clasping at base ..
..... 2. L. sativa

ee. Bracts, and also usually the leaves,
winged-petiolate or tapered at base.

f. Pappus on a long and thin beak;
panicle narrow, crowded, \pm lan-
ceolate 3. L. canadensis

ff. Pappus sessile; panicle ample,
broad and open 6. L. floridana

1. L. SERRIOLA L. (f. integrifolia (Bogenh.) G. Beck, var. integrata G. & G.; L. Scariola L.; L. virosa AA.) -- Prickly Lettuce (Plante boussole, Escarole) -- Leaves with a row of stiff acicules on the back of the midnerve. Leaves lobed or not, spinulose-margined, on sunny days becoming twisted into a common vertical plane. Inflorescence ample, heads very narrow, yellow, often drying blue. Mid summer to early fall. Waste places, uncommon. --(NS)-PEI-BC, US, Eur, (Afr).

2. L. SATIVA L. -- Lettuce (Salade, Laitue) -- Leaves broadly flabellate or obovate, cordate-clasping at base, passing into the numerous cordate bracts. Somewhat spinulose-toothed along the leaf margins but not along the midnerve. Heads small, numerous, tending to become corymbose. Late summer and early fall. Commonly cultivated; rarely and fleetingly spontaneous: Fort Saskatchewan. --O, Alta, (US, Eur).

3. L. canadensis L. (var. latifolia Kuntze, var. longifolia (Mx.) Farw., var. montana Britton; L. integrifolia Big.) -- Devil's Weed (Chicorée blanche) -- Very variable, the leaves sometimes narrowly lanceolate, entire and clasping at base, but typically they are pinnatifid with a winged petiole. Inflorescence leaves and bracts attenuate at base. Involucre 10-15 mm high. Pappus white, borne on a filiform beak. Early summer. Dry, open places. --NS-seMan, seBC, US.

Reported by Groh 1950 for Eastend, Sask. The justifying specimen (DAO) has since been revised to L. tatarica var. heterophylla. The source of the Saskatchewan reports by Fernald 1950, Gleason 1952 and Scoggin 1957 is still to be traced. These may rest on specimens, such as those of Bourgeau, with outdated or vague geographical documentation. A listing by Russell 1937, 1944 was merely speculative. An Alberta report by Rydberg 1932 has not been investigated.

4. L. ludoviciana (Nutt.) Riddell -- Like the last, but the leaves spinulose dorsally along the midnerve and

the heads longer. Inflorescence an open panicle. Involucre 15-23 mm high. Mid summer. In the shrubby zone around bluffs. --(O-Man)-seS, US.

5. L. tatarica (L.) C.A. Meyer var. heterophylla (Nutt.) Boivin (var. pulchella (Pursh) Breitung; L. pulchella (Pursh) DC.) -- Blue Lettuce -- Especially conspicuous along roadsides, a virgate herb with large blue heads of ligulate flowers. Leaves narrowly lanceolate, entire, or the lower remotely lobed. Heads 2-3 cm wide. Mid summer. Scattered on the prairie, becoming conspicuous when the soil is disturbed. --seK-Mack-(Y)-Aka, Q-BC, US.

Stat. n., Mulgedium heterophyllum Nutt., Trans. Am. Phil. Soc. 2, 7: 441. 1841; Lactuca pulchella (Pursh) D.C. var. heterophylla (Nutt.) Farw., Ann. Rep. Mich. Ac. Sc. 6: 214. 1904. The latter combination establishes the priority of heterophylla at varietal rank.

Our plant is weakly differentiated from the siberian var. tatarica in which the leaves bear smaller, more remote and somewhat spinulose teeth.

A white-flowered form is known from Minnesota and probably occurs in our area, merely awaiting a sharp-eyed collector. It may be designated as f. Stevensii f.n., floribus albis. Typus: O.A. Stevens 2514, Felton, Minn. Aug. 10, 1961 (DAO).

6. L. floridana (L.) Gaertner -- Resembles L. canadensis, but the inflorescence is more open and the achene is beakless, the pappus sessile. Leaves pinnatifid to pinnatifid, the terminal lobe broadly deltoid. Flowers blue. Mid summer. Edge of woods, rare: Otterburne.--SO-seMan, US.

7. L. biennis (Moench) Fern. (L. spicata AA.) -- Pappus tinted grayish to pale brown, otherwise similar to L. canadensis. Main leaves pinnatifid, the upper ones narrow, entire auriculate-clasping at base. Involucre ± 1 cm high. Mid to late summer. Low and wet places. -- (Aka), L-NF-(SPM), NS-BC, (US).

Closely related to L. floridana and perhaps only varietally distinct.

68. LYGODESMIA D. Don

Ligules pink, the heads very narrow and containing only about 5 florets. Achene tapered at beak. Pappus of smooth bristles. Tegules dimegueth, the outer ones many times shorter.

a. Perennial; involucre 1.0-1.5 cm high .. 1. L. juncea
aa. Annual; involucre 1.5-2.0 cm high 2. L. rostrata

1. L. juncea (Pursh) D. Don -- Skeleton-Weed -- A skeleton weed with pink ligules. Rhizomes deeply buried. Very branched from near the base. Branches longitudinally

striate. Leaves many but narrow, small and appressed, not very conspicuous and mostly shorter than the internodes. Heads terminal, solitary. Mid summer. A common prairie and steppe species. --sMan-sBC, US.

2. L. rostrata Gray -- Leaves and heads longer than the last. Blending in its surroundings and very hard to see. Leaves very narrow and very long, 2-6 times longer than the internodes. Branching mainly near the top. Heads terminal and axillary. Late summer. Bare or semi-bare sands, mainly in blowouts. --swMan-sAlta, cUS.

69. AGOSERIS Raf.

A basic type, scapose with monocephalous scapes and a pappus of non-plumose bristles on a beaked achene. Bristles minutely scabrous. Tegules imbricated. Resembles Taraxacum, but the achene is not acicular-muricate towards the top.

a. Beak 2-4 times as long as the body of the achene; tegules strongly dimorphic..... 3. A. grandiflora
aa. Beak shorter; outer tegules shorter, but otherwise similar to the inner.

b. Achene with beak half as long as the body or less; ligules yellow, drying yellow..1. A. glauca
bb. Beak longer; ligules deep orange, often drying purplish 2. A. aurantiaca

1. A. glauca (Pursh) raf. var. glauca (var. agrestis (Osterh.) Q. Jones, var. dasycephala AA., var. parviflora (Nutt.) Rydb.; A. agrestis Osterh.; A. parviflora (Nutt.) Dietr.; A. scorzonerifolia AA.; A. turbinata Rydb.) -- A native resembling the common, weedy Dandelions, but the leaves entire to narrowly lobed and the tegules not squarrose. Also resembles Microseris, but the latter has tomentose-ciliate leaves. Herbage entirely glabrous or quite often tomentose towards the summit of the scape and on the involucre, more rarely pilose on the stem and/or the leaves irregularly retrorse-ciliate towards the base, but glabrous on both faces, yet the midnerve sometimes pilose. Early to mid summer. Common in prairies. --O-BC, US--Var. dasycephala (T.& G.) Jepson (A. scorzonerifolia (Schrader) Greene -- Herbage pubescent throughout, becoming lanate on the involucre and towards the summit of the stem. Leaves pubescent on both faces, at least towards the edges. -- Cypress Hills, Grande-Prairie and Rockies. --Mack, Alta-BC, US.

A range extension to Yukon by Anderson 1949, repeated by Hultén 1950, queried by Boivin 1967, was based on a British Columbia collection from mile 611 along the Alaska Highway. See under Aster conspicuus above.

2. A. aurantiaca (Hooker) Greene var. aurantiaca -- Closely similar to the first, the top of the peduncle den-

sely lanate. Beak of the achene thin, up to twice as long as the body. Leaves more commonly dentate to remotely lobed. Mid summer. Alpine and sub-alpine prairies. --Mack-Y-(Aka), Q, swAlta-BC, wUS.

In a more southern var. purpurea (Gray) Cronq. the tegules are larger, more strongly imbricated and purple-spotted.

3. A. grandiflora (Nutt.) Greene -- Herbage lightly villous below to more densely so above, sometimes glabrescent. Leaves entire to more commonly pinnatifid. Outer tegules rhomboid-ovate, acuminate, broader than the inner. Ligules yellow, drying yellow or sometimes purplish. Early summer. Lowland meadows. Lake Saskatoon. --wcAlta-swBC, wUS.

70. CREPIS L.

Much resembling Agoseris, but with the stem more or less leafy and the inflorescence of more than one head. Achene beakless or short-beaked.

- a. Annual or biennial weed.
 - b. Leaves mostly cauline 5. C. tectorum
 - bb. Rosette leaves more numerous ... 6. C. capillaris
- aa. Perennial natives with a strong taproot; leaves mostly in a basal rosette.
 - c. Depressed and nearly stemless plant with the basal leaves overtopping the heads 2. C. nana
- cc. Stem well developed and the heads much overtopping the foliage.
 - d. Glabrous; stem branchy and leafy throughout 1. C. elegans
- dd. At least the rosette tomentose or hirsute; stem leaves, bracts and heads mostly borne in the upper third of the plant.
 - e. Plant glabrous above, the rosette coarsely hirsute 3. C. runcinata
- ee. Herbage lightly to densely tomentose throughout 4. C. occidentalis

1. C. elegans Hooker -- Glabrous throughout, somewhat glaucous and slightly fleshy. Tufted and very branchy, 1-2 dm high. Lower and basal leaves petiolate, lanceolate, entire or nearly so, the upper linear and sessile. Heads numerous, 6-8 mm high. Summer. Gravel flats of braided glacial streams. --Mack-Aka, wAlta-eBC, (nwUS).

2. C. nana Rich. var. nana (ssp. ramosa Babcock) -- Like a dwarf version of the last, the stem so short that the basal leaves usually overtop the inflorescence. Taproot long and thick, rather large in relation to the aboveground parts. Involucre dark green, 9-13 mm high.

Mid summer. Alpine shale slides. --F-(K)-Mack-Aka, L-NF, swAlta-BC, wUS, (eEur).

Occasional specimens have a more elongated stem (=var. elongata). These are readily distinguished from C. elegans by the size of the heads.

In the alaskan and east-asiatic var. lyratifolia (Turcz.) Hultén the leaves are † pinnatifid.

3. C. runcinata (James) T. & G. var. runcinata (C. glauca Rydb. C. perplexans Rydb.) -- Very much like a Taraxacum, the leaves † runcinate and all basal, but the stem bearing more than one head and bracteolate in the inflorescence. Rosette leaves sometimes entire, coarsely hispid, not glandular. Tegules glandular-hispid, the glands yellow; sometimes also finely puberulent. Early to mid summer. Common in wet places; alkali tolerant. --sMan-BC, US -- Var. glauca (Nuttall) Boivin (C. glauca (Nutt.) T. & G.) -- Involucre not glandular, merely finely puberulent, or more commonly glabrous. Mainly on alkaline prairies and shores of playas. --(sMan)-S-Alta, US -- Var. hispidulosa Howell (C. platyphylla Greene) -- Larger and the leaves usually glandular along the midnerve. Pubescence otherwise as in var. runcinata. Leaves ovate to lanceolate, usually larger, 1 dm long or more, 4 cm wide or more. Heads numerous, usually more than 10. Grassy highlands: Cypress, Waterton. --swS-Alta, wUS.

The range had been extended eastward to Timmins, Ontario, in Nat. Mus. Can. Bull. 156: 246, 1958, but the justifying collection (MT, TRT) has since been revised to Leontodon autumnalis L. var. pratensis (Link) W.D.J. Koch.

4. C. occidentalis Nutt. var. occidentalis (var. costata Gray; C. atribarba Heller; C. intermedia Gray) -- Leaves deeply lobed, pinnatifid to pinnatipartite, the lobes triangular to filiform and entire to dentate. Inflorescence corymbose. Heads few to many, usually grayish-tomentose, commonly 1.0-1.5 cm high, bearded with thick, black hairs about 0.5 mm long. Early summer. Montane prairies and Milk River Valley. --swS-SBC, US.

More western plants in which the involucre is devoid of thick black hairs are distinguished as var. cytotaxonomicorum (Boivin) stat. n., C. atribarba Heller var. cytotaxonomicorum Boivin, Nat. Can. 87: 31. 1960 (and ultimately ssp. originalis Babc. & Stebb.)

This species varies within unusually broad limits; the more obvious phenotypic variant has the leaves pectinately dissected into remote, narrow and usually entire segments; it has been called C. atribarba, but it is not discretely separable from the run-of-the-mill C. occidentalis and the rank of variety (i.e. var. gracilis D.C. Eaton) would be more realistic. We have not given it recognition at any rank because, at least in the canadian part of its range, it seems to present itself as an ex-

treme of variation of sporadic occurrence.

Canadian reports of C. acuminata Nutt. and C. angustata Rydb. were based, at least in part, on specimens of var. cytotaxonomicorum. This remark may possibly apply also to some of the earlier reports of C. intermedia discussed below.

C. modocensis Greene, a more southern species, appears to grade into C. occidentalis on the one hand and also into the more southern C. acuminata Nutt. on the other. Neither C. modocensis var. C. acuminata are known in Canada, but intermediates to C. occidentalis do occur. It is customary to use C. intermedia Gray to designate such intermediate specimens. We are not too clear as to their significance; they do not appear to be hybrids, yet we are not able at present to offer a classification that would reflect taxonomically and account realistically for the existence of such extraneously related intermediates in our flora. Over a period of years we have tried now to consolidate the members of this series into a single species (C. occidentalis), now to treat them as so many species, but we have not been able to achieve a satisfactory treatment either way.

5. C. TECTORUM L. -- Tegules pubescent on both faces, being strigose on the inner. Annual (or biennial) and very variable. Stem simple, becoming very branchy. Rosette leaves evanescent, being usually wilted by flowering time. Stem leaves numerous, lanceolate to long linear or filiform, entire to pinnatifid. Involucre 7-9 mm high, tomentose and glandular-pubescent. Seeds 2.5-4.5 mm long, with a short thin beak and a white pappus. Summer. Common weed of roadsides, railways, etc. --G, sMack-Y, (NF, NS)-PEI-BC, US, Eur, (Oc).

6. C. CAPILLARIS (L.) Wallr. -- Somewhat like the last but biennial and retaining its abundant rosette all summer. Branchy and often many-stemmed, the lowermost internode(s) usually quite short. Stem leaves mostly subtending branches and smaller than the rosette leaves, the latter mostly 1-2 dm long. Tegules pubescent on the outer face only, or glabrous on both faces. Heads small, the involucre only 5-8 mm high. Seeds beakless and only 1.5-2.5 mm long. (Late summer?). Rare weed of drier and open places: Calgary.--NS, NB-O, swAlta-BC, US, (SA), Eur, (Oc).

Our only collection (MTMG) is undated. It was made by M.E. Moodie about half a century ago.

71. PRENANTHES L. RATTLESNAKE-ROOT

A middling type with a leafy stem and beakless seeds bearing a white and smooth pappus. But the flowers are nearly white or pale pink and the inflorescence is race-

mose or paniculate. Habitally often similar to Lactuca, but the seeds not flattened.

a. Inflorescence abundantly hirsute 1. P. racemosa
aa. Glabrous.

b. Tegules green; pappus lightly tinged ...
..... 2. P. sagittata

bb. Tegules purple; pappus chestnut brown ..
..... 3. P. alba

1. P. racemosa Mx. (Nabalus racemosus (Mx.) DC.)-- Copiously hirsute in the inflorescence, glabrous and glaucous below. Lower leaves oblanceolate, petiolate, the upper ones much smaller, sessile and cordate-clasping. Involucre purple. Ligule pink to nearly white. Pappus yellow. Late summer. Wet prairies, infrequent. -- (seK), NF, NS, NB-neBC, US.

2. P. sagittata (Gray) Nelson -- Leaves sagittate, remotely dentate, the upper successively rhomboid then lanceolate. Lower leaves often opposite. Petiole winged. Inflorescence narrow. Ligules white. Pappus straw-coloured. Mid summer. Mountain woods: Rockies and Swan Hills. --Alta, (nwUS).

3. P. alba L. (Nabalus albus (L.) Hooker) -- Rattlesnake-Root -- Main leaves deltoid, remotely dentate to deeply lobed. Lower petioles not winged. Pedicels very short. Ligules white. Pappus deep brown. Second half of summer. Low woods. --Q-cS, (US).

72. HIERACIUM L.

HAWKWEED

Like Prenanthes, but the flowers typically yellow and the inflorescence commonly umbellate.

a. Leaves mostly basal.

b. Leaves glabrous or nearly so 3. H. triste

bb. Copiously long hirsute.

c. Flowers orange-red 1. H. aurantiacum

cc. White 5. H. albiflorum

aa. Leaves all or mostly borne on the stem.

d. Leaves fairly uniformly distributed on the stem, the lower ones wilted or deciduous by flowering time 2. H. umbellatum

dd. Leaves borne mostly in the lower third of the stem, the others few and much smaller ...
..... 4. H. cynoglossoides

1. H. AURANTIACUM L. -- Devil's Paint-Brush, King-Devil (Marquerite rouge, Saint-Louis) -- Heads red-orange, tending to dry deep red. Herbage copiously very long hirsute throughout and more or less purplish. Involucre densely pubescent with a mixture of long hirsute hairs, shorter glandular ones and very small stellate hairs. Mid summer. Rare and recent roadside introduction. --NF-

(SPM), NS-O, Alta-BC, US, Eur.

Has been repeatedly reported for Manitoba by Lowe 1943, Frankton 1955, 1970, Scoggan 1957, Budd 1957 and 1964, Best 1964, and Boivin 1966 on the basis of a Winnipeg collection. Yet in 1966 no such collection could be located at WIN or elsewhere and we are now speculating that, if any specimen ever existed, it may have been revised to some other taxon.

2. H. umbellarum L. (var. canadense (Mx.) Breitung; H. canadense Mx.; H. columbianum Rydb.; H. scabriusculum Schwein.) --(Accipitrine) -- Leaves typically remotely dentate. Pubescence variable. No basal rosette and the lower leaves early deciduous. Leaves broadest below the middle. Heads often subumbellate. Mid and late summer. --Mack-(Y-Aka), L-NF-(SPM), NS-Alta-(BC), US, Eur.

A somewhat variable species, found on both sides of the Atlantic. Mainly on the basis of pubescence variability, the Canadian material has been subdivided into about 20 taxa. In Europe, where the genus is dealt with on the basis of national monographs, this species has been further subdivided into a host of microspecies.

3. H. triste W. var. gracile (Hooker) Gray--Smallest and green below, but conspicuously black-pubescent in the inflorescence. Commonly less than 3 dm high. Herbage glabrous or nearly so below, becoming densely long pubescent in black in the inflorescence, the pubescence mixed with much shorter and partly glandular hairs. Younger plants are sometimes finely pubescent to the base. Leaves less than 1 dm long, oblanceolate, rounded at tip. Involucre 6-8 mm high. Mid summer. Meadows towards timberline. --Mack-Aka, wAlta-BC, wUS, (SA).

In the more western typical phase the longer hairs reach 2-4-(5) mm and are usually not glandular. In our variety they are only 0.5-1.5 mm long and often partly glandular.

4. H. cynoglossoides A.-T. (H. albertinum Farr; H. Rydbergii Zahn; H. Scouleri AA.) -- General habit of H. aurantiacum and H. albiflorum, but the ligules yellow and the leaves mostly borne towards the base of the stem. Leaves and lower part of plant densely long-hirsute, the upper part variously hirsute or glandular or stellate-pubescent. Larger leaves mostly 1-2 dm long. Involucre mostly 8-10 mm high. Mid summer. Montane prairies and light woods; Cypress and Rockies. --Alta-sBC, nwUS.

H. Scouleri is listed by Porsild 1959 for the Rockies, but all specimens so named at CAN, GH and V have been revised to H. cynoglossoides.

5. H. albiflorum Hooker -- Ligules white and the herbage devoid of stellate pubescence. Otherwise quite

similar to H. aurantiacum but the long hairs very dense towards the base, becoming very sparse in the inflorescence. First half of summer. Lodgepole forests. -- (Y)-Aka, (seMan)-swS-BC, wUS.

ADDITIONS AND CORRECTIONS

The following information became available only after the corresponding text had been given its final form for printing.

Page 9 -- Cuscuta Gronovii W. -- It must be recognized that the U.S. material at hand is much more variable than ours. Some of the U.S. specimens examined do have much longer and lanceolate corolla lobes, other specimens do have much smaller capsules loosely enclosed by the marcescent corolla, etc. Therefore we are not precluding that some of the distinctions rejected for our Canadian material could be applicable and pertinent to more southern populations.

Page 15 -- Penstemon albidus Nutt. -- Dawson's 1875 report of P. glaucus Graham from the Second Crossing of the Souris River (DAO) was ignored by Macoun 1884, but referred to P. gracilis by Scoggan 1957. It proved to be based on a specimen of P. albidus.

Page 17 -- Penstemon gracilis Nutt. -- The stem is minutely retrorse-puberulent, at least towards the base.

Page 19 -- Limosella -- The leaf width is not a fully reliable distinction between L. aquatica and L. subulata, but these may be further contrasted as follows:

L. aquatica L. -- Stoloniferous, the stolons green, superficial, and usually present in the herbarium. Flower 1.0-2.0 -(2.5) mm long, the corolla only slightly (or not at all) exerted; typically only the lobes are exerted. Ripening capsule with a white line along the suture, eventually opening by two valves, these finely pencil-margined in white.

The last character is transposed in Fernald 1950.

L. subulata Ives -- Stolons thinner, white, slightly buried, fragile and usually absent in the herbarium. Flower larger, 2.5-4.0 mm long, the corolla being 1½ times the length of the calyx; typically the corolla lobes are fully exerted along with part of the tube. Capsule not lined in white, rupturing irregularly at maturity.

The reports of L. subulata for our area by Boivin 1967 and above are to be discounted as they were based on collections from Granum and Ponoka (both DAO) with filiform leaves but with the smaller flowers, etc., of L. aquatica and they have been revised accordingly. Reports from Alberni, B.C. and Keewatin are also to be referred to L. aquatica on similar grounds. L. subulata is then apparently restricted in its distribution to the tidal shores of the east coast of North America.

Page 20 -- Veronica longifolia L. -- Mostly 5-10 dm high. Leaves all opposite, or the uppermost often alternate or verticillate. Calyx green, much less densely puberulent than the rest of the inflorescence, the lobes finely ciliate and lightly puberulent on back. Style 7-9 mm long after the fall of the corolla.

The above criteria will bring out the differences with V. spicata.

Page 20 -- Add the following species:

1a. VERONICA SPICATA L. -- (Perse brunette) -- Quite similar to V. longifolia but generally smaller, mostly 2-4 dm high. More densely puberulent, becoming grayish in the inflorescence. All leaves opposite. Calyx as densely puberulent as the rest of the inflorescence and † grayish. Style 4-6 mm long after the fall of the corolla. Infrequent ornamental, rarely spreading to roadsides; Lacombe. --Q, Alta, (US), Eur.

Page 23 -- Agalinis purpurea and its variety parviflora should be eliminated from our area.

First reported by Hooker 1838 as Gerardia purpurea from Saskatchewan where collected by Drummond. This was repeated by many later authors, but the use of Saskatchewan in Hooker does not coincide with the modern meaning of Saskatchewan as a province. Reports in the latter sense were justifiably discounted by Breitung 1957. Indeed the label of Drummond's specimen merely reads "Norway House to Canada" (K). Pennell 1935 studied this sheet, and cited it under Gerardia paupercula borealis as coming from "Manitoba (?)". However Drummond's geographical data was essentially vague and in the absence of a later confirmation it seems unwarranted to assume that his specimen was actually collected in Manitoba rather than further to the east.

A report from Morden by Lowe 1943 was discounted by Scoggan 1957 as being based on a specimen of G. aspera. Similarly the collection Garton 3537, Stony Mountain (DAO) cited by Scoggan 1957 as G. paupercula has since been revised to Agalinis aspera. A Dawson collection from Lake of the Woods (MTMG) was listed by Dawson 1875 as G. purpurea and by Scoggan 1957 as G. paupercula. It belongs with A. tenuifolia var. parviflora as do all collections studied from the southeastern part of the province.

Thus we are left without any unquestioned voucher to the presence of A. purpurea (or G. paupercula) in Manitoba.

Page 24 -- Agalinis tenuifolia (Vahl) Raf. -- Axillary fascicles are usually present in our var. parviflora

(Nutt.) Pennell, and the capsule is 5-7 long. In the more eastern and less boreal typical phase, var. tenuifolia, axillary fascicles are usually lacking, the calyx lobes do not exceed 1 mm, and the smaller capsule is only 3-5 mm long.

Page 25 -- Castilleja lutescens (Greenman) Rydb. -- Also in Waterton and the Pincher Creek areas. Older Alberta reports of C. pallida var. septentrionalis by Macoun 1884 and others were primarily based on specimens of C. occidentalis, but the Dawson collection seems closer to C. lutescens.

Page 29 -- Pedicularis flammea L. -- Add: F. flavescens Pol. -- Corolla monochrome in yellow. Cadomin. -- (nQ)-nO, swAlta.

Page 29 -- Pedicularis Oederi var. albertae is to be versed into the synonymy of P. flammea of which it is only a more abundantly villous extreme.

The difference in pubescence between P. flammea and P. Oederi is not sharply marked, despite some keys, including ours above.

On the basis of the more abundant material now at hand, the variation in pubescence runs as follows:

P. Oederi. Herbage more or less villous throughout or at least in the inflorescence. But sometimes the herbage is completely glabrous except for the ciliate bracts and calyx lobes.

P. flammea is typically glabrous except for the ciliate bracts and calyx lobes. Varies to completely glabrous and eciliate, or again to more or less villous in the inflorescence.

The two species are obviously close to each other, yet quite distinct, and may be contrasted as follows:

P. Oederi. Usually 1-2 dm high in flower, elongating to 2-3 dm in fruit. Flowers larger by half, (16)-20-(25) mm long. Calyx 8-11 mm long, its lobes \pm dilated and \pm toothed at tip. Corolla exserted from the calyx by \pm 1 cm. Galea 2-3 mm wide and tinged or spotted in red towards the tip. Lower corolla lobes spreading \pm horizontally. Style exserted by (0.1)-0.5-1.0-(2.0) mm.

P. flammea is generally a smaller plant with smaller and more deeply coloured flowers. Usually less than 1 dm high at flowering, elongating to 2 dm in fruit. Flower (11)-14-(16) mm long. Calyx 6-9 mm long. Corolla exserted by 5-7 mm. Galea 1.5-2.0 mm wide, deep red for about half of its length. Lower corolla lobes divergent by 30-45°. Style not protruding from the hood

of the galea.

Page 33 -- Orobanche fasciculata Nutt. -- The range extension to Ontario is based on a single plant recently collected at La Cloche Island (OAC). For Anoplanthus read Anoplanthus.

Page 33 -- Orobanche uniflora L. -- On the basis of the length and shape of the calyx lobe this species is divisible into a pair of geographical variants as follows:

Var. uniflora -- Calyx lobes less than twice as long as the tube, gradually narrowed into an attenuate tip which is shorter than the main triangular portion of the lobe. Cypress Hills. --(Y)-Aka, NS-(PEI)-NB-O, swS, US.

Var. minuta (Suksd.) Beck -- Calyx lobes longer and more abruptly narrowed, at least twice as long as the tube, the main portion of the lobe tending to be deltoid and shorter than the caudate tip. Waterton. --soAlta-BC, wUS.

More than 90% of the specimens will conform well to the above criteria relative to their geographical origin, but quite a few are transitional and the odd one (ignored for the purpose of the above ranges) will be completely atypical.

A further subdivision of the western phase is sometimes attempted in which var. minuta (=var. Sedi (Suksd.) Achey) is restricted to the smaller-flowered plants, while var. purpurea (Heller) Achey denotes the rather showy larger-flowered plants. Both varieties appear to have the same range; the rank of form would probably be more appropriate, if the distinction is deemed desirable.

Page 38 -- Geranium pratense L. var. erianthum (DC.) Boivin -- The flowers are typically bluish-mauve, but a white-flowered mutant is known: f. leucanthum f. n., petalis albis. Typus: W.B. Schofield 2489, Alaska, Cold Bay, flowers white, rare among typically blue-flowered plants on sheltered tundra slope, July 28, 1952 (DAO). Still known from a single alaskan collection, but expected to be sporadic throughout the range of the species.

Page 56 -- Mertensia lanceolata (Pursh) A. DC. var. lanceolata -- Our plant grows in closed tufts and its stems bear (8)-10-(15) leaves. It is barely distinct from the rare arctic var. Drummondii (Lehm.) stat. n., Lithospermum Drummondii Lehman, Nov. Stirp. Pug. 2: 26. 1828; Mertensia Drummondii (Lehm.) G. Don. The latter is more loosely tufted, the caudex branches more or less elongated and abundantly clothed with stubs of old petioles, the stem leaves only 5-8-(10) to a stem. No con-

sistent difference could be detected in the floral parts.

Page 70 -- An undetermined species of Mentha has been recorded as persisting in a long abandoned garden at Glenevia (Pegg 1213, DAO). By its ovate leaves, its long and dense pilosity, etc. it resembles M. rotundifolia (L.) Hudson, a species known to persist occasionally in southern Ontario. However, our plant differs in a number of respects: its pubescence is longer in the inflorescence, its spikes are leafy-bracted, the bracts being large, its calyx is somewhat longer with longer pubescence, etc.; we have yet to find a satisfactory name for it.

Page 70 -- For Elscholtzia read Elsholtzia.

Page 210 -- Agoseris glauca (Pursh) Raf. -- The herbage will vary from completely glabrous to \pm lanate on the involucre and at the summit of the stem. The pubescent phase has been commonly identified and reported upon as var. dasycephala or as A. scorzonerifolia. But both forms are generally common, they have been reported throughout our area and do not appear to be taxonomically significant. If however var. dasycephala be defined in a somewhat more restrictive manner, as we have done above, it does become a geographically restricted variety.

Because of our more restrictive definition of var. dasycephala, it seems preferable to discount all previous reports except such as were checked and conformed to our criteria. All Manitoba sheets examined, including Marshall's from Brandon (DAO), belonged to var. glauca. Earlier Saskatchewan reports of A. scorzonerifolia were discounted by Breitung 1957 and all specimens examined, including Breitung 4442 (DAO), were placed with var. glauca. Similarly most Alberta specimens were referred to var. glauca. But all Mackenzie sheets examined were closer to var. dasycephala.

The leaves vary from entire to dentate, or more rarely pinnatifid with the lobes narrow and somewhat remote. The last phenotype (=var. agrestis) seems to occur throughout our range and accordingly it has been submerged into the typical phase.

Page 215 -- Hieracium triste W. var. triste -- Now known to our area on the basis of the following: G. Scotter 16857 & 16950, Tonquin Valley, Jasper Park, 1971 (DAO). The general range: swMack-Aka, swAlta-BC, wUS (Wyoming), (eEur).

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